October 1982

The independent magazine for the independent user

sinclair user

60p

Issue No 7

BIGGEST ISSUE EVER 84 PAGES FOR ONLY 60p



How to choose your cassette player

Spectrum delivery problems 'ending'

New home computer launched

Clive gives his views on our golden future

We profile one of the leaders in the export boom

Meet the winner of our EPROM blower competition

Plus 11 pages of programs, software and hardware reviews, helpline, mindgames, news and your letters

JOIN THE SINCLAIR USER CLUB

MICHAEL ORWIN'S ZX81 CASSETTES

THE BEST SOFTWARE (BY VARIOUS AUTHORS) AT LOW PRICES

QUOTES

"Michael Orwin's £5 Cassette Two is very good value. It contains 10 stolid well designed games which work, offer plenty of variety and choice, and are fun."
From the ZX Software review in
Your Computer, May '82 issue.

"I had your Invaders/React cassette . . . I was delighted with this first cassette."
P. Rubython, London NW10

"I have been intending to write to you for some days to say how much I enjoy the games on 'Cassette One' which you supplied me with earlier this month."
E.H., London SW4

". . . I previously bought your Cassette One and consider it to be good value for money!"

Richard Ross-Langley
Managing Director
Mine of Information Ltd.

CASSETTE 1
(eleven 1k programs)

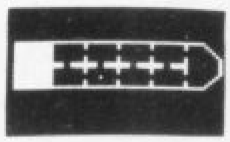
machine code:
React, Invaders, Phantom aliens, Maze of death, Planet lander, Bouncing letters, Bug splat.
Basic:
I Ching, Mastermind, Robots, Basic Hangman. PLUS Large screen versions of Invaders and Maze of Death, Ready for when you get 16k.
Cassette One costs £3.80

CASSETTE 2
Ten games in Basic for 16k ZX81

Cassette Two contains Reversi, Awari, Laser Bases, Word Mastermind, Rectangles, Crash, Roulette, Pontoon, Penny Shoot and Gun Command.
Cassette Two costs £5.

CASSETTE 3
8 programs for 16k ZX81

STARSHIP TROJAN

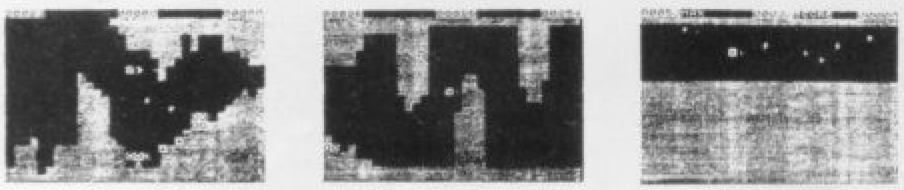


Repair your Starship before disaster strikes. Hazards include asphyxiation, radiation, escaped biological specimens and plunging into a Supernova.

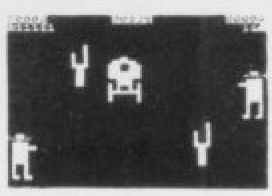
STARTREK This version of the well known space adventure game features variable Klingon mobillity, and graphic photon torpedo tracking.
PRINCESS OF KRAAL An adventure game.
BATTLE Strategy game for 1 to 4 players.
KALABRIASZ World's silliest card game, full of pointless complicated rules.
CUBE Rubik Cube simulator, with lots of functions including 'Backstep'.
SECRET MESSAGES This message coding program is very txlp qexi jf.
MARTIAN CRICKET A simple but addictive game (totally unlike Earth cricket) in machine code. The speed is variable, and its top speed is very fast.
Cassette 3 costs £5.

CASSETTE 4 8 games for 16k ZX81

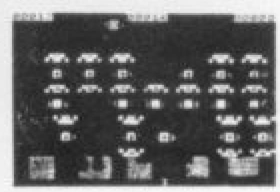
ZX-SCRAMBLE (machine code) with 3 stages.
Bomb and shoot your way through the fortified caves.

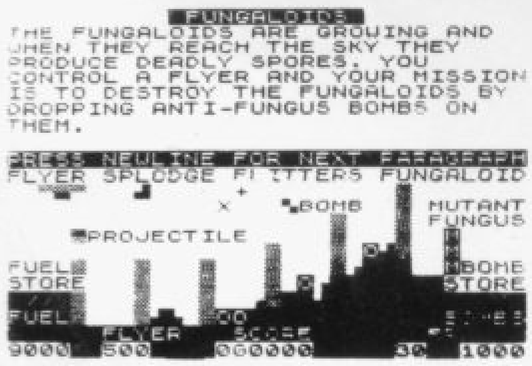


GUNFIGHT
(machine code)



INVADERS
(machine code)





GALAXY INVADERS (machine code)
Fleets of swooping and diving alien craft to fight off.
SNAKEBITE (machine code)
Eat the snake before it eats you. Variable speed. (very fast at top speed).
LIFE (machine code)
A ZX81 version of the well known game.
3D TIC-TAC-TOE (Basic)
Played on a 4 × 4 × 4 board, this is a game for the brain. it is very hard to beat the computer at it.

7 of the 8 games are in machine code, because this is much faster than Basic. (Some of these games were previously available from J. Steadman). Cassette 4 costs £5.

Recorded on quality cassettes, sent by first class post, from:
Michael Orwin, 26 Brownlow Rd., Willesden, London NW10 9QL (mail order only please)

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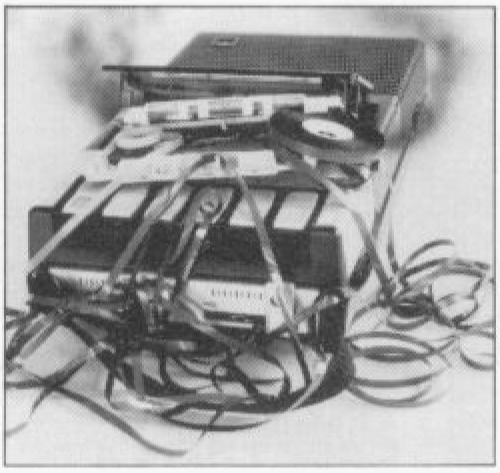
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If you would like to contribute to Sinclair User, please send typed (or beautifully hand-written) articles or programs to:
Sinclair User
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London N1 8BJ

We will pay £10 for each program printed and £50 for each article, which should be approximately 1,000 words long.

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page 50

FREE INSIDE — Spectrum User devoted to news about the Spectrum, its uses and its problems.

NEXT MONTH

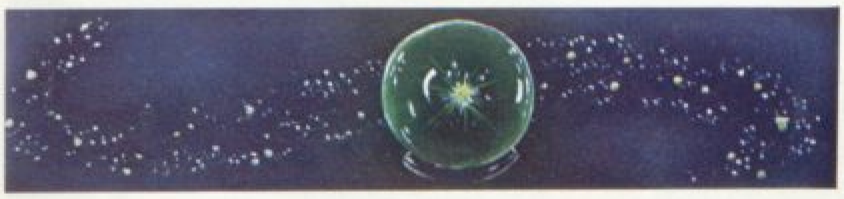
- **We assess the growing amount of software available for the business user**
- **Another look behind the scenes in Sinclair Research**
- **More software for the Spectrum**



Spectrum excuses run out

SINCLAIR RESEARCH announced the Spectrum in a blaze of publicity in April. At the time the company was stating that the machine was ready to be despatched and that production was ready to meet the expected demand.

The confidence of the company was matched by the enthusiasm with which people placed their orders. Since then, nothing seems to have gone right and the disillusion of customers throughout the



country has grown. *Sinclair User* has been flooded with telephone calls and letters from people expressing their dissatisfaction with the way they have been treated.

The level of the anger has filtered through to Sinclear Research and Clive Sinclair considered the situation to be so bad that he wrote to the magazine explaining the problems. It is printed in *Spectrum User*. A voucher for £10 and a promise that the backlog should be cleared by the end of September is being offered to customers, some of whom have been waiting for three months.

The most unfortunate feature is that it could easily have been avoided. Sinclair Research makes great play of the fact that it can work to strict deadlines, It is an ability of which to be proud — if it can be achieved. There is no reputation to be gained from making claims which cannot be justified.

The company can advance any number of excuses but the fact remains that it has not been



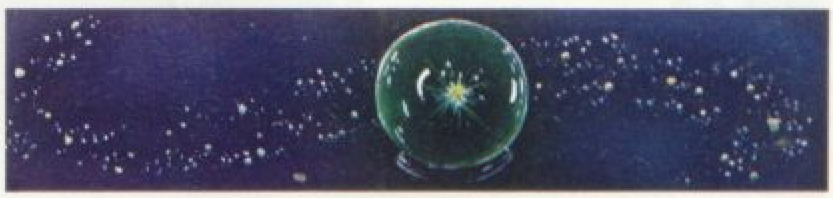
able to substantiate the claims it made at the time of the launch. Problems in gearing-up to full production, obscure faults discovered after production began, and unexpected demand are all acceptable in companies new to the market but Sinclair Research has had the experience of two previous machines, yet still seems unable to profit from experience.

The only excuse for not making sure that the Spectrum was ready to go ahead as soon as it was announced, with a suitable stock to ensure that unexpected demand could be met, was that it had to rush to market a machine to beat the opposition. That does not apply in this case.

It would have made no difference to the competitive position of Sinclair if the machine had not been announced until September. It would, however, have made a great difference to its position with its customers.

It has been said that Sinclair Research is a company with a technology bias. That is used as an excuse for its poor customer relations. That is a reasonable comment for a company which is doing research work for other companies. It is not acceptable for one wishing to deal so closely with the public.

It is also inconsistent. Clive Sinclair is scarcely an innocent where employing the media to publicise his successes is concerned. The shortcomings

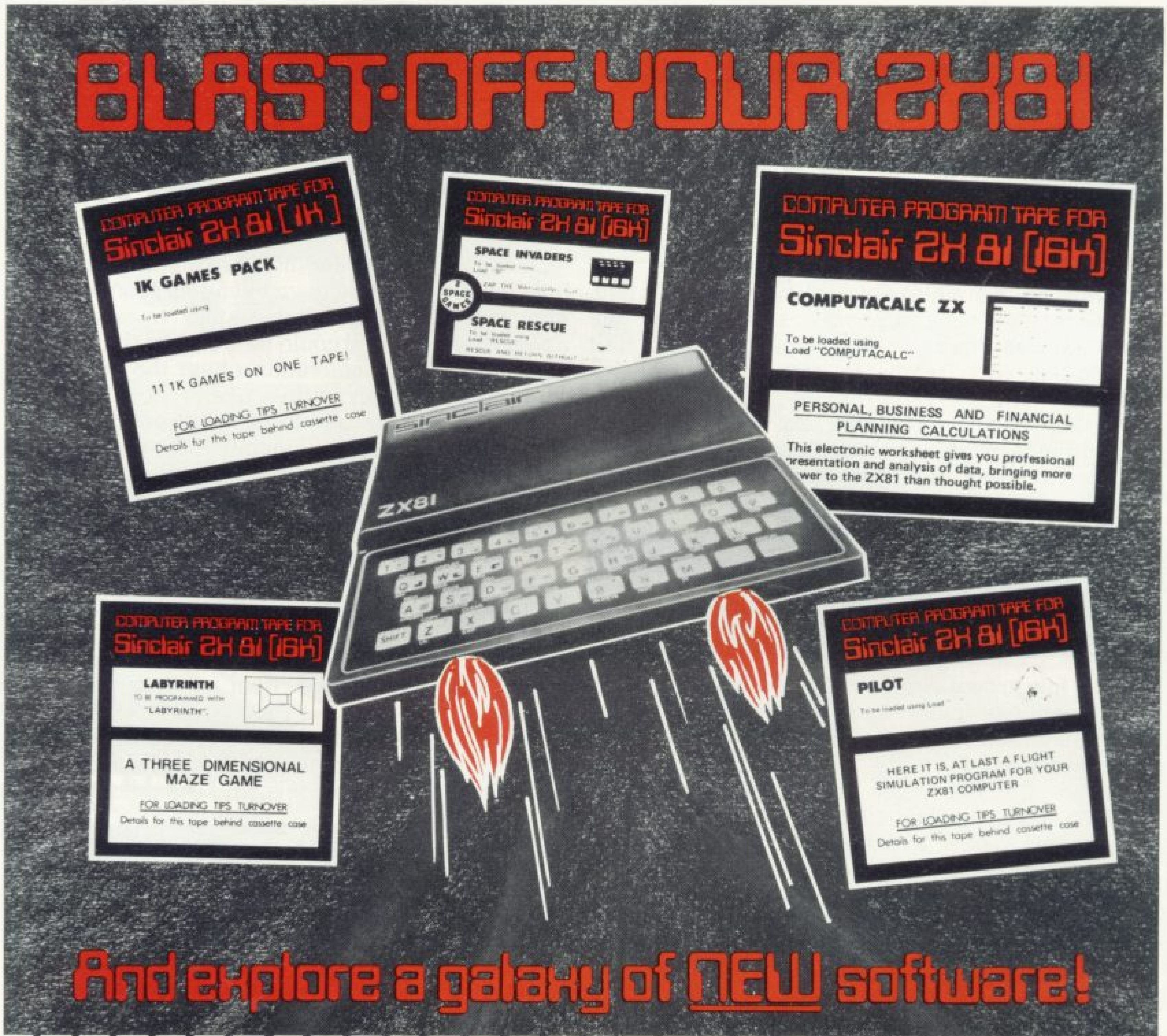


appear once the machine has been developed and the market has been created.

None of that should detract from the achievements of the company. In a very short time it has developed a dominant position in the home computer market. Such success, however, brings its own pressures. Others see the profits which can be made and in a short time methods which worked less than a year ago are no longer sufficient to ensure that the leading position is maintained.

Clive Sinclair is worried, and probably rightly so, about the threat from the Japanese. It has not appeared yet. The only competition has been from other British companies, which seem to suffer from the same delivery problems as Sinclair Research. It will not last for ever. The best way to meet the threat is to have the proper product at the proper place at the proper time and the ability to meet the demand satisfactorily.

Sinclair scores on the product side. Once it can organise its production effectively it should have no difficulty in justifying the image it has built for itself.



All these titles are available now from your local Bookstore or Computershop. In case of difficulty, send cost of tape plus 25p postage per tape with the coupon to: Software Masters Ltd., 30 Lincoln Road, Olton, Birmingham B27 6PA. Trade enquiries welcome!

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Major Savings on software for business

Prices of Hilderbay range are cut by 10pc

OUR OFFER to club members this month has a strong bias towards people who prefer to use their Sinclair machines for serious applications.

The major part of the offer, which as usual is exclusive to members of the Sinclair User Club, is a 10 percent reduction in the price of the products of Hilderbay. The company range includes a tested tape recorder and a loading aid, as well as a large range of business software.

The price reductions, listed below, are a major saving and will go a long way to off-setting the cost of membership.

All the prices quoted include VAT and postage and packing except for the tape recorder, for which an extra £2 is charged.

As seen in the listing, some of the software is also available for the Spectrum.

The rest of this month's Star Offer is made up by the Micro Gen chess program for the Spectrum, known as Master Chess. Again this is being offered at a discount to members of 10 percent. That reduces the normal price of £9.90 to £8.90 for club members. As usual, to permit new members to take advantage of these offers you can include an order with your application form.

Members can take advantage of the discounts until the end of October.

STAR BARGAIN

	Usual Price	Club Price
Tape Recorder	£22	£19.80
Hilderbay loading aid	£5.95	£5.35
Software for the ZX-81:		
Beamscan	£25	£22.50
Payroll	£25	£22.50
Stock Control	£25	£22.50
Optimax	£40	£36.00
Budget I and II	£17	£15.30
Time Ledger	£15	£13.50
Critical Path	£15	£13.50
Financial Pack	£8	£7.20
Gold	£5	£4.50
Program Planning Package	£138	£124.20
Spectrum software:		
Payroll	£25	£22.50
Stock Control	£25	£22.50
Gold	£8	£7.20
Program Planning Package	£138	£124.20

Telephone service answers problems

A NEW service is available for members of our popular Sinclair User Club.

A telephone problem-answering service is now available, exclusive to members. The number has been announced on the cassette sent to members midway through August.

Members will be able to telephone the number with any problems they may have in using the Sinclair machines. We started the service because we thought it important that members should have somewhere they could obtain expert advice immediately.

The August cassette was the first to be sent

continued on page 8

MEMBERSHIP FORM

I wish to join the Sinclair User Club and enclose my subscription of £12

Name ....

Address ....

....

....

....

Which computer do you own?

ZX-81 ☐ Spectrum ☐

Send your coupons to Sinclair User Club, ECC Publications, 30-31 Islington Green, London N1 8BJ. Cheques should be made payable to Sinclair User Club.

continued from page 7

since we began the Sinclair User Club. They were produced for both the ZX-81 and the Spectrum.

They contain the first in a series of articles on how to use machine code in programming. The introductory article, written for people who already know how to program in Basic, compares commands in Basic to those in machine code.

The cassettes also contain a special bomber game, with versions for both the ZX-81 and the Spectrum.

Cassettes have been sent to all people who joined the Sinclair User Club by the second week in August. Those who joined after that date will receive their first cassette at the beginning of October.

As well as the second article in the machine code programming series it is intended to have a problem page service, with matters which are of special concern to members, more games for the ZX-81 and Spectrum, and news about the activities of club members.

The cassette and the telephone problem-line are just two of the advantages to be gained from joining the Sinclair User Club. It is also possible to obtain discounts on a number of popular items which are available to enhance their Sinclair machines.

Each month we arrange a special Star Offer which is usually available until the end of the month. We are also considering offering longer-term discounts on a variety of items in the growing market for hardware add-ons and software.

A year's subscription costs £12 and that can easily be recouped by taking advantage of the special discounts which we negotiate for our members.

To take advantage of all these benefits, complete the application form today, making sure that you indicate which machine you own so that we can send you the correct cassette.

Britain

Aylesbury ZX Computer Club: Ken Knight, 22 Mount Street Aylesbury (5181 or 630867). Meetings: first Wednesday and third Thursday of the month.

Doncaster and District Micro Club: John Woods, 60 Dundas Road, Wheatley, Doncaster DN2 4DR; (0302) 29357.

Edinburgh ZX Users' Club: J. Palmer (031 661 3183) or K Mitchell (031 334 8483). Meetings: second Wednesday of the month at Claremont Hotel.

EZUG-Educational ZX-80/81 Users' Group: Eric Deeson, Highgate School, Birmingham B12 9DS.

Glasgow ZX-80/81 Users' Club: Ian Watt, 107 Greenwood Road, Clarkston, Glasgow G76 7LW (041 638 1241). Meetings: second and fourth monday of each month.

Hassocks ZX Micro User Club, Sussex: Paul King (Hassocks 4530).

Inverclyde ZX-81 Users' Club: Robert Watt, 9 St. John's Road, Gourock, Renfrewshire, PA19 1PL (Gourock 39967). Meetings: Every other week on Monday at Greenock Society of the Deaf, Kelly Street, Greenock.

Keighley Computer Club: Colin Price, Redholt, Ingrow, Keighley (603133).

Merseyside Co-op ZX Users' Group: Keith Driscoll, 53 Melville Road, Bootle, Merseyside L20 6NE; 051-922 3163.

National ZX-80 and ZX81 Users' Club: 44-46 Earls Court Road, London W8 6EJ.

North Hertfordshire Home Computer Club: R Crutchfield, 2 Durham Road, Stevenage; Meetings: first Friday of the month at the Settlement, Nevells Road, Letchworth.

North London Hobby Computer Club: ZX users' group meets at North London Polytechnic, Holloway Road, London N7 each Monday, 6pm.

Nottingham Microcomputer Club: ZX-80/81 users' group, G E Basford, 9 Holme Close, The Pastures, Woodborough, Nottingham.

Orpington Computer Club: Roger Pyatt, 23 Arundel Drive, Orpington, Kent, (Orpington 20281).

Perth and District Amateur Computer Society: Alastair MacPherson, 154 Oakbank Road, Perth PH1 1HA (29633). Meetings: third Tuesday of each month at Hunters Lodge Motel, Bankfoot.

Scunthorpe ZX Club: C P Hazelton, 26 Rilestone Place, Bottesford, Scunthorpe; (0724 63466).

Sheffield: Andrew Moore, 1 Ketton Avenue, Sheffield S8 8PA would like people interested in starting a club in the area to contact him enclosing a stamped-addressed envelope for details.

Swindon ZX Computer Club: Andrew Bartlett, 47 Grosvenor Road, Swindon, Wilts SN1 4LT; (0793) 3077. Monthly meetings and software library.

Thames Valley ZX Users' Club: Richard Shepherd, 22 Green Leys, Maidenhead, Berkshire SL6 7EZ; (0628) 21107 (evenings and weekends). Hopes to start meetings on a regular basis.

Worle Computer Club: S W Rabone, 18 Castle Road, Worle, Weston-super-Mare BS22 9JW (Weston-super-Mare 513068). Meetings: Woodsprings Inn, Worle, on alternate Mondays.

ZX Guaranteed: G A Bobker, 29 Chadderton Drive, Unsworth, Bury, Lancashire. Exchanges information and programs throughout the country.

ZX-80/ZX81 Users' Club: PO Box 159, Kingston-on-Thames. A postal club.

Overseas

Belgium, France, Luxembourg: Club Sinclair, Raymond Betz, 38 Chemin du Moulin 38, B-1328 Ohain, Belgium (322 6537468)

Belgium, Netherlands: Microcomputer Vereniging BZW, Paul Glenisson, Priester de l'Epéestraat 14, B-1200 Brussels, Belgium (322 7349954)

Denmark: Danmarks National ZX-80/81 Klub (DNZK), Jens Larson, Skovmosevej 6.4200 Slagelese, post giro 1 46 24 66.

ZX-Brugergruppen i Danmark, Boks 44, 2650 Hvidovre. Gratis medlemskab og gratis blad til enhver interesseret.

East Netherlands: Jonathon Meyer, Van Spaen Straat 22,6524 H.N. Nijmegen; (080 223411).

Germany: ZX-80 Club, a postal club; contact Thomas Jenczyk. Hameln, Postfach 65 D-3250 Hameln, Germany.

Indonesia: Jakarta ZX-80/81 Users' Club, J.S. Wijaya, Jakarta, Indonesia.

Republic of Ireland: Irish ZX-80/81 Users' Club, 73 Cnoc Crionain, Baile Atha, Cliath 1.

Singapore: Sinclair Users' Group: Eric Mortimer, 1D Wilmer Court, Leonie Hill Road, Singapore.

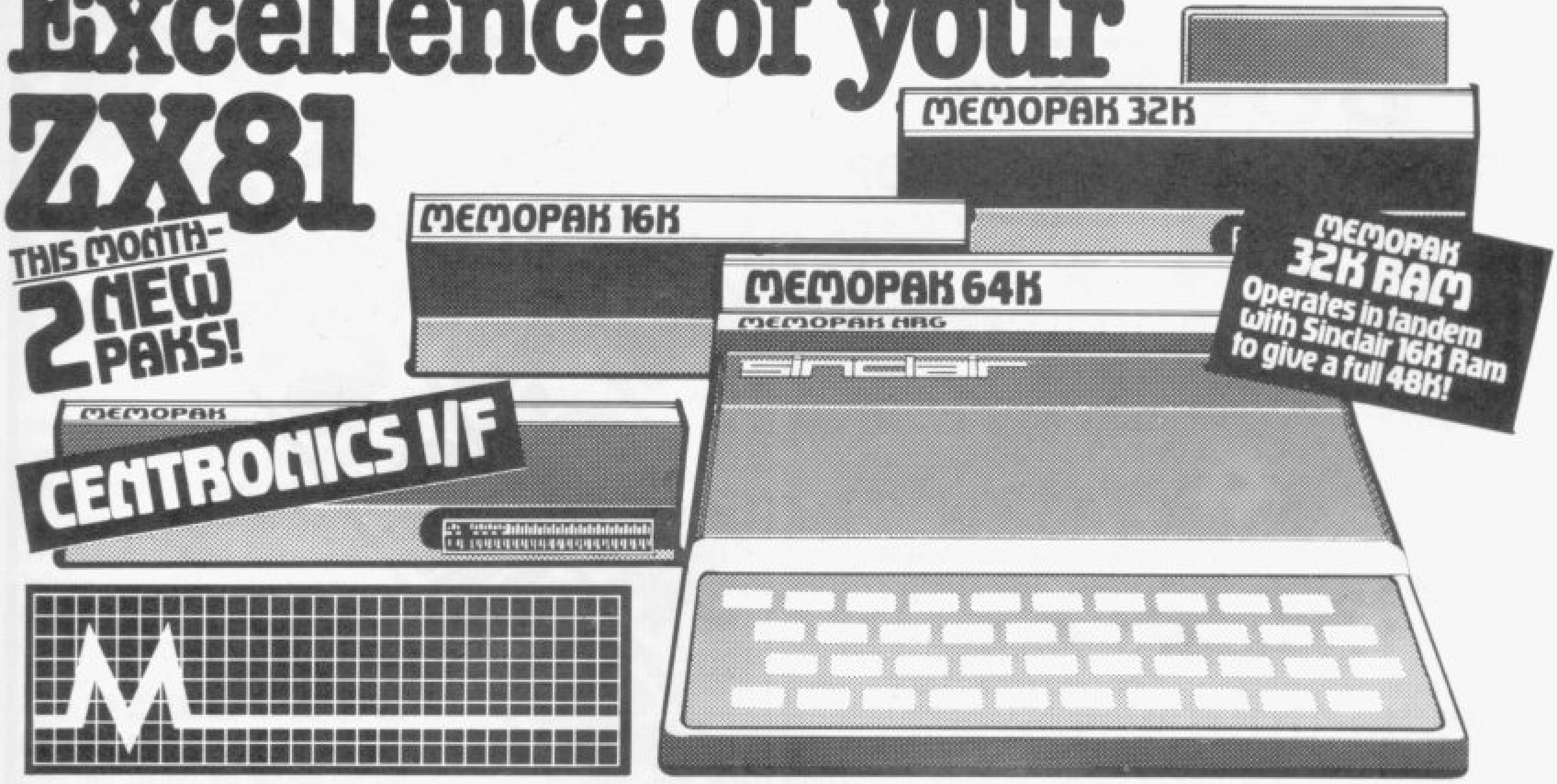
South Africa: Johannesburg ZX80/81 Computer Users' Club: S Lucas, c/o Hoechst SA (Pty) Ltd, PO Box 8692, Johannesburg. Teaches Basic and machine code, interest in hardware.

Johannesburg ZX Users' Club: Lënnërt ER Fisher, PO Box 61446, Marshallstown, Johannesburg.

Spain: Club Nacional de Usuarios del ZX-81, Joseph-Oriol Tomas, Avda. de Madrid, No 203 207, 10, 3a esc. A Barcelona-14 Espana. International ZX Spectrum Club: Gabriel Indalecio Cano, Sardana, 4 atrico 2a, San Andres de la Barca, Barcelona. Send international reply coupon. Produces a bi-monthly magazine.

United States: Bay Area ZX-80 User Group, 2660 Las Aromas, Oakland CA94611. — Harvard Group, Bolton Road, Harvard MA 01451; (617 456 3967).

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These two packs extend and complete the Memotech RAM range (for the time being!) A notable feature of the 32K pack is that it will run in tandem with the Sinclair 16K memory extension to give 48K RAM total.

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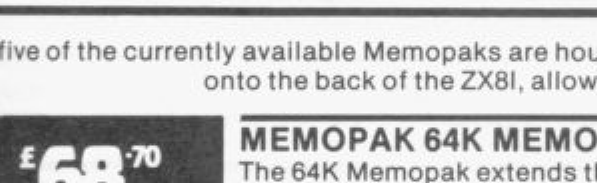
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Uses existing power supply. New 32K Ram Pack is tested and guaranteed with the following 16K Ram Packs-Byg Byte, Sinclair, Downsway.

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● 16K Ram Pack	£22.00	☐
● New 32K Ram Pack	£39.50	☐
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Spectrum designers use Forth in new home micro

ANOTHER cheap micro has been produced for the home market. The Jupiter Ace is the first computer to be designed by Richard Altwasser and Steven Vickers since they finished design work on the Spectrum.

The new machine, which will be sold by mail order for £89.95, uses the language Forth instead of the more usual Basic used on other microcomputers. Forth was chosen because of its "combination of speed, versatility and ease of programming".

The computer looks rather like a cross between a ZX-80 and a Spectrum. It has a full-size moving-key keyboard, although one thing it does not have is the one-key entry system for which the Sinclair machines have become famous.

As with the Sinclair machines, the Ace can be used with a domestic television set and uses an ordinary cassette recorder for back-up memory. The basic unit has only 3K RAM.

The screen is memory-mapped with a 24 × 32 character flicker-free display and user-definable high-resolution graphics. The cassette interface performs at 1,500 baud and has a Verify command.

It also has a programmable sound generator. "We hope it will be louder than that of the Spectrum," said Vickers.

The Ace will be manufactured by TW Electronics. It has an expansion socket at the rear which the designers hope to use for peripherals, RAM expansion and a colour board. The machine was due for unveiling at the Personal Computer World Show in September.

Colour Genie launch

THE COLOUR Genie is another computer to be unveiled at the Personal Computer World Show. The machine has been produced by Lowe Electronics of Matlock, Derbyshire, and will cost £199.

The new computer will have 16K Basic ROM and 16K of user RAM. The typewriter-style keyboard is similar to previous Genies.

The machine can use up to 16 colours on the screen with a resolution of 160 × 96 for graphics characters. There are 128 programmable graphics characters and 64 present characters.

There will be a range of optional accessories, including a printer interface cable, printer, two joysticks, a position-detecting light pen and a cassette recorder. A full range of software is due to be launched after the launch of the machine.

Lowe now has eight Genie models in its range of computers, including the new Genie III Business System which was also due to appear ot the PCW Show.

£100 is offered to beat ZX-81

A SOFTWARE company is confident that it has produced one of the most difficult games for the ZX-81 that it is offering a prize of £100 to anyone who can beat the computer.

The game, **Awari,** is produced by Understanding of London. It is in three levels of difficulty — rabbit, beast and monster. The prize is being offered to the first person to send a solution to beat the computer at the monster level playing both first and second.

A deadline in early January has been set because of fears that it may not be possible. If no-one has provided a solution by then, the prize will go to the person nearest to winning.

Staff at Understanding have managed to win only playing first at the monster level and the person who wrote the program has not passed the beast.

Awari was developed as a teaching aid and was adapted for micros when home computing began to take off. It is based on a West African game involving distributing beans between seven cups.

Entry forms are available when buying the cassette.



Nigel Boyle

Prices are set to tumble

PRICES of ZX-81 software and hardware are on the way down. Software cassettes for games and business applications which formerly had cost £6 of £7 may now be cheaper by up to £1 or £2.

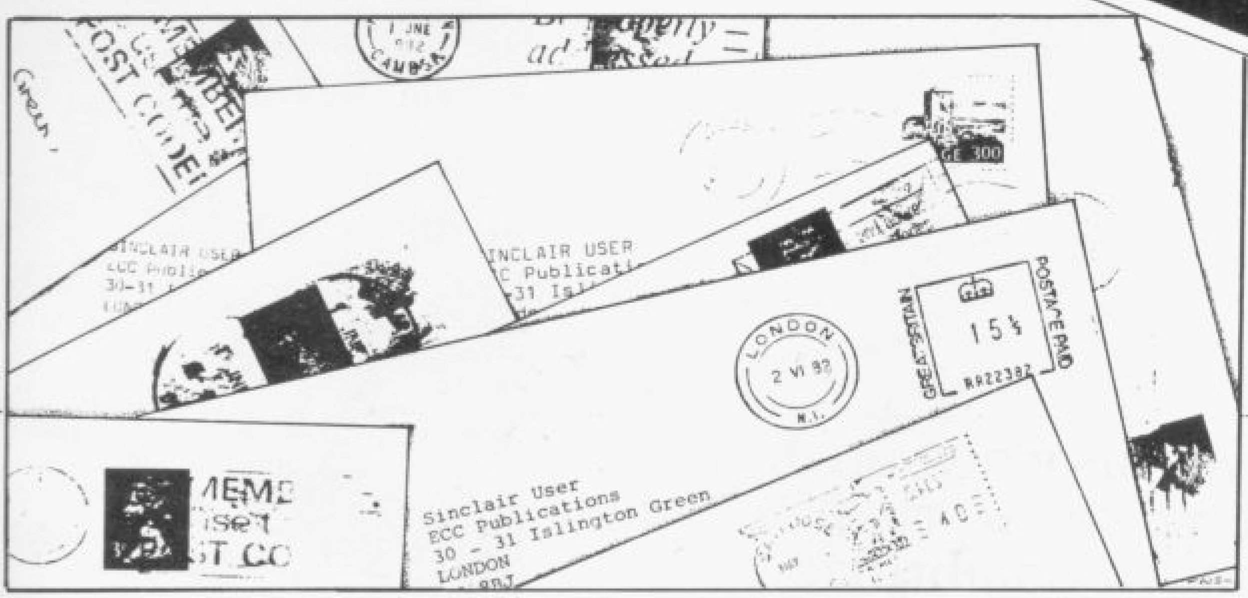
Quicksilva is one of the companies to have started the move. Its software cassettes **Scramble** and **Asteroids** are down from £5.50 to £4.95.

Hardware is also becoming cheaper and not only because of the drop in market demand. The Quicksilva high-resolution graphics board is down from £85 to £60. Quicksilva says that the drop in price is to keep the ZX-81 hardware moving.

Data-Assette has reduced the price of its data retrieval system, the ZX-99, to £49.95. The reason, said the sales manager Nigel Boyle, was "because Sinclair brought down prices to around £10 cheaper than the ZX-99".

Boyle sees no difficulty in continuing to sell ZX-81 add-ons.

"The ZX-99 makes the computer more advanced. Even if the machine is black and white it gives it data retrieval."



Doubt over accuracy test

IN HIS letter in the August issue, M P Campbell refers to the consecutive application of sin, cos, tan, arctan, arccos, and arcsin — to get back to the original value — as a check for the accuracy of a calculator in handling trigonometric functions.

That artificial test is not a good one as it can give poor results with calculators which are satisfactory for handling complex trigonometric functions in real problems. Campbell quotes a half percent error on Casio calculators and 33 percent error on Sinclair calculators. Using a starting value of pi/4 (45 deg.) my 100-step programmable Novus calculator does not even complete the sequence as an intermediate result is outside the permitted range of the argument for the next function.

When that test is applied to the ZX-81 your correspondent states: "You will be amazed and aghast alternately at the results".

You may be amazed, because the ZX-81 has a much better calculating ability than most desk calculators, but you should not be aghast unless you overlook the argument and result ranges for which the functions are valid.

For example, sin pi/4, sin 3pi/4 and sin 9pi/4 all give the value 0.70710678 (SQR 2)/2) but arcsin 0.70710678 gives pi/4 (0.78539816) because the result of arcsin must be one value and is therefore limited to the range -pi/2 to pi/2.

If the sin cos sequence is started with 3pi/4, it will finish with pi/4.

C. Cuthbert,
Penwortham,
Preston, Lancs.

Rooting for family trees

I SHOULD be grateful if you would let me know if there is any software suitable for recording family trees designed for ZX-81 plus 16K RAM. I may be wrong but I think there may be more to such a program than a simple recorded list.

L Gross,
London, N12.

•*We have not seen any programs for family trees but perhaps readers might be able to help.*

Program points cleared

I READ your magazine with interest and always try the programs in it. Only about four out of every five work; for instance, Tim Crossley's program for **Snap** contained several errors. First, I believe line 110 should read: 110 IF INT(C/2) = C/2 THE LET B = 18

Also if Bar is printed after the word cherry, you get a new word — BARRRY. Inserting the line:
120 PRINT AT .0.Ø,B;A$;
"   " (3 spaces)
instead of line 120 deals with the problem.

One of the problems for any magazine is the general printing of the programs. I know that the quality of some printers is not 100 percent but I am sure bad lines could be printed again, in clear letters. Take for instance Tim Crossley's program again; I could not tell what line 110 read — the first +, if it is a plus, which I believe is " = ", is very confusing.

Alex Clark,
Lichfield, Staffs.

Black Jack error code

IN PUBLISHING my letter regarding **Black Jack** in the June issue, an error crept into lines 20 and 50. They should read:
LET CA = INT (RND * 13) + 2

Ted Maynell,
Penrith, Cumbria.

Adding 16K can be easy

I HAVE read that if a program has been SAVED by a computer with only 1K RAM and subsequently a 16K RAM has been added the 1K program could not be re-loaded without removing the memory expansion.

I have found, on my ZX-81 at least, that is not true. You simply load the program, run it once, 'break' it and run it again. It should work perfectly.

I have bought every issue of your magazine and I think it is great.

Andrew Smith,
(aged 12),
Harlow, Essex.

Plea for notes on listing

I LIKE your magazine very much; I find it very helpful. There is still a great deal which I find very baffling but that is probably my fault. I have tried some of your programs but the clarity is not very good.

In a program there must be notes on what the lines do, so if there are variables which can be changed to alter speed and numbers, I can do so. It helps if I could be told whether to make them smaller or larger; I find that an easier way of learning programing than wading through handbooks and their useless examples.

Michael Jones.

Delivery difficulties

I SOMETIMES have problems obtaining *Sinclair User*. Could you inform me where I can buy it?

John Durant,
Lowestoft, Suffolk.

• *The best way is to take an annual subscription. Alternatively you can order it from your newsagent, quoting our ISSN number, 0262-5458.*





Clive Sinclair gives his views on the future of the Western civilised world to a British Mensa symposium in Cambridge

Computers will bring a new Golden Age

AS WELL as being head of Sinclair Research, Clive Sinclair is chairman of British Mensa, an exclusive club whose members have IQs which reach the genius level.

In a speech at the Mensa Golden Ages symposium at Cambridge, Sinclair outlined his ideas for the future, not of his range of personal computers but of the Western civilised world. He said: "I intend arguing that the most Golden Age of man's history may well lie before us, if we can only move in the right direction."

The new age would need to be triggered by an event which will startle society. The trigger, Sinclair explained, would be something similar to the invention of writing or moving type. He said: "Both of those developments reduced the cost of data transmission by a factor of 100."

He saw leisure, or periods of time not occupied by formal work, as an opportunity to broaden the mind. If the trigger occurs at the proper time and the Golden Age arrives "the body of men arises which can turn its attention to matters other than necessities. Thus wealthy patrons produce the great flowerings of arts which are a feature of the Golden Ages.

"Equally, the Golden Ages are often marked by one great individual, a type of philosopher-prince, e.g., Pericles, Augustus, Lorenzo de Medici, Elizabeth I and Louis XIV."

In business operations, Sinclair seems to regard the personal approach best. One man at the head of a company. He has stressed that approach many times through Sinclair Research, so that now he is as famous as his machines, whereas other manufacturers remain masked by their company exteriors.

During his speech Sinclair referred his ideas to the present day. He saw the Golden Age as being very close. Some of the features which marked the Golden Ages of the past could be identified within our time. That could place us on the threshold of a new Golden Age. To demonstrate it, Sinclair returned to the idea of a trigger.

"Is there a trigger? It so happens that another hundred-fold reduction in the cost of data publication and transmission is about to occur. A single 12in. diameter optical disc, being developed for use with TV can, remarkably enough, contain the information of 10,000 books and that disc will cost not much more than a few books — almost, in fact, a thousand-fold reduction in costs."

The reduction in costs and the innovations in mass marketing are compared to what Sinclair calls "the potential of the individual".

'I believe that our move away from the industrial type of organisation will restore the potential of the individual'

Until now, society has accepted that people will work together in large groups. People work in large companies, they commute into towns and cities every working day. That massing of the working population is the motive force behind the present state of the economy.

Sinclair said: "We have for some time been passing through a great industrial age in which the economic basis of society has demanded the bringing together of people in great numbers, many thousands per factory, many millions per city. I believe that our move away from this type of organisation will restore the potential of the individual."

Individual human potential is something Sinclair seems largely to favour. While Sinclair Research is a company, like many others, where everyone pulls together, it is still mostly a one-man operation. Sinclair is the man who defines what he wants and lays-out the timetable for its development.

That style of operation has so far proved successful, first with the ZX-80 and ZX-81 and now with the Spectrum. The hundreds of firms



Lorenzo de Medici, Elizabeth I and Louis XIV were patrons of earlier golden ages. Will the computer be the patron of the next?

'Early in the next century we will have made intelligent machines ending for all time the pattern of drudgery'

which give support to Sinclair microcomputers would also seem to prove his point to be correct.

Sinclair sees the new Golden Age as being a time of the mind, with less stress put on the body and building culture rather than labouring. He feels that another Golden Age requirement is an abundant supply of patrons, people who can appreciate, as well as create, art.

"We have a well-educated population, a society which reveres the arts, and have become a world centre for music and for the written word."

The reason for the swing towards cultural pursuits is marked with the stigma of a current curse on society.

Sinclair said: "We have potential artists, partly for the sad reason that we have three million unemployed; this is not a passing phase of recession but a trend which will last until the end of the century, during which I expect the manufacturing industry to shed a further seven million jobs and for the proportion employed in manufacturing to decline from some 42 percent of the population to less than 10 percent. This will occur as automated systems are now radically cheaper than manual costs."

The resulting factors of unemployment due to technological innovation and automation will leave the population with a lot of spare time if present trends continue. If the number of unemployed rises to more than 90 percent it may be necessary to redefine the term altogether.

The type of work people do would change drastically. A new concept of work would have to be created. That is where culture and the processes of the mind would enter. People would have more time to learn and so understanding of many areas of science would improve.

"We must change the pattern of expectation — no longer to prepare people for a life-time's work in major organisations but to give them the self-reliance for a broader role in smaller groups.

"Many, if not all, of today's young people will always work for small organisations and indeed must found them. We must encourage people to follow this route if we are to create future employment — whether in high technology, in a revival of a class, or in service industries."

Sinclair foresees a new 'creative endeavour'. People are experiencing new technology, seeing what it can do for them. It can relieve them of manual tasks so that they can use their minds more fully.

Young people were just beginning to learn about new technology. According to Sinclair, the learning process would only be the beginning. Learning the techniques of putting ink on to paper was only the beginning of writing creative prose and poetry — learning to communicate successfully. Learning about new technology through machines such as the ZX-81 and the Spectrum which, because of low prices, were within the reach of nearly everybody, was the beginning of a process which may lead to what Sinclair believes is a new Golden Age.

"Because we no longer need to devote the bulk of our time to the production of objects, I can see the plateau of a Golden Age before us. Certainly we may need inspiration and leadership, great building, a bridge over rather than a tunnel under the Channel.

"Early in the next century we will have made intelligent machines ending for all time the pattern of drudgery — with them we can start the exploration of the universe. It may be that Western civilisation, seeded in seventh-century Ireland is only just about to flower."

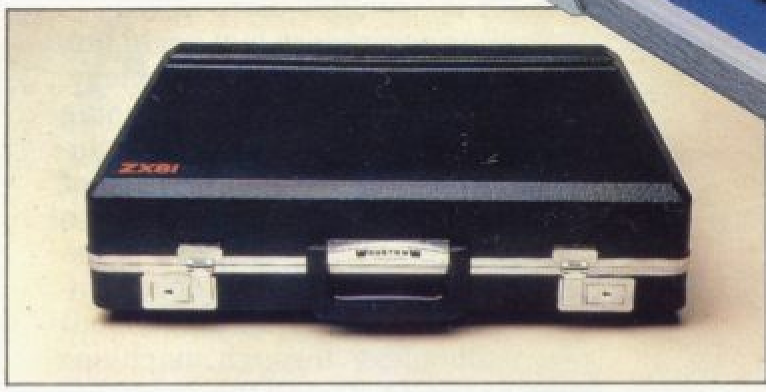
To some, Sinclair's ideas may seem like science fiction but some cynics said that a machine like the Spectrum was not possible only last year.

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Zeta software aims at schools



SOLENT SOFTWARE Engineering Ltd, of Brookvale, Waterworks Road, Otterbourne, Winchester S02 2DP produces the Zeta range of educational software, which Solent states has been fully-tested and developed by middle school teachers in Hampshire.

Eight titles were provided for review, on high-quality cassettes which ensured first-time loads; 16K RAM is required.

Each program is literature-supported with comprehensive operating instructions, a description of the game, how it works, what it does, and how to restart it after a break. Full marks for such a good documentation.

Graphs draws bar charts of the class birthdays. It ran well and, like all the other Zeta programs, is very robust. I would, however, have liked to see a more general graph-drawing program, with provision for copying the results to a printer.

Depth Charge and **Zilog** are ordered triple (X,Y,Z) and ordered pair (X,Y) co-ordinate games. In Depth Charge, a submarine has to be hunted while in Zilog an incoming spaceship must be destroyed. The games are good but the graphics displays could have been a little larger.

Spell Invaders tests words set by a teacher, up to a limit of 10. A word is displayed, then blanked-out; the child has to "spell" it by shooting letters of the alphabet, Space Invaders style. Three incorect letters only are allowed.

It is a very good game, which would have been even better with some means of printing-out a certificate with name, score and words tested on it.

Oxo-, **Oxox** and **Oxo+** are simple mathematics games based on noughts and crosses, with sums displayed on the board, two children playing against each other to win the game by solving the problems and thus getting a row of their symbols. The only trouble with the game is that you may have difficulty getting the children using it to let someone else do so.

Reaction Test is a computer familiarisation game in which letters are displayed and the appropriate keyboard letter has to be pressed. The response of the children is timed.

At £5.75p each, or £42 the set, these may seem a little expensive. That is not so. Solent Software states in its literature that "where the original purchaser is a school or college, additional copies of the programs may be made for use on other computers only within the said school or college."

Considering that they worked well, and taught specific things, the set of programs would be a good addition to the software library of any school, Particularly as you would not have to rely on only the one set of tapes.

Flights of fancy from Hewson



BUDDING AVIATORS can test their skills with the Hewson Consultants **Pilot** — not a game but a flight simulation program. There are seven modes — including landing, heading towards a beacon, taking off — and points are awarded for correct execution of each manoeuvre. Tired pilots can choose the Autolanding mode, in which the computer does everything for you. Non-fliers abstain.

The same firm also offers an above-average maze game called **Puckman**. You must imagine you are a small humanoid scouring the maze for magic strawberries which keep at bay the monsters trying to devour you. There are many monsters to make it exciting and you can work up a good speed dodging round the corners.

Both cassettes are on 16K, costing £5.95 each, and are available from Hewson Consultants, 60A St Mary's Street, Wallingford, Oxon OX10 0EL.

Byte Man in the Mindseye

MINDSEYE offers good value with three games on one 16K cassette for £2.95. The title game is **Byte Man**, in which a cheerful-looking monster chases you round a maze littered with food pills. The aim is to score points by eating the pills before the monster — and his brothers and sisters — eat you.

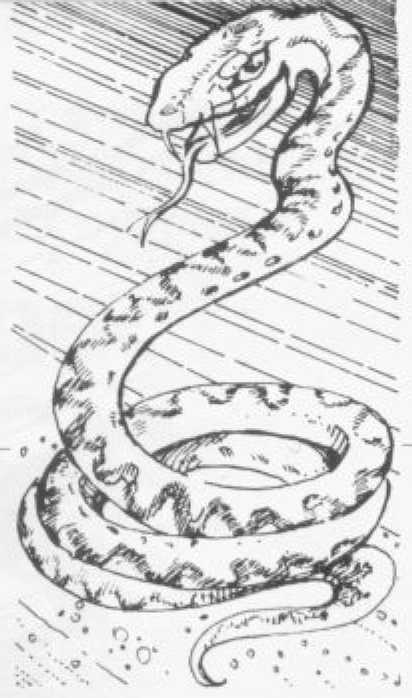
You have three lives and the computer will enter your score, so several people can play.

Space Fighter is a fast-moving shooting battle against swarms of enemy spacecraft. You will need quick wits and fingers to obtain a high score. Finally, **Bomber**, a simple, absorbing game, in which you have 30 bombs to destroy a dam. Different parts of the dam are worth

continued on page 18







continued from page 17
varying numbers of points, so some careful planning, as well as accurate bombing, is needed to improve your score. The Byte Man cassette is obtainable from Mindseye, 12 North Grove Drive, Leeds, W. Yorkshire, LS8 2NJ.

Episode 4 by Michael Orwin

MICHAEL ORWIN has built a reputation for value-for-money software and his Cassette 4 offers quantity as well as quality. There are eight games on the cassette, seven of which are in machine code and six of them are arcade-type games.

Guns is a marvellous moving graphics version of the Gunshooter game, for one or two players. Bullet speed and skill level can be entered and each gunslinger has six shots per round. In the one-player game, the computer would give Clint Eastwood a run for his money.

ZX-Scramble is another arcade game; you try to manoeuvre your ship through a cave while bombing the enemy and shooting their defending fighters. Ever-popular **Invaders** and **Galaxy Invaders** are on the cassette, along with **Life**, **3D-Tic-Tac-Toe**, **Fungaloids** — a moving graphics bombing game — and **Snakebite**, an original graphics chase game which can be tailored by the player.

Cassette 4 costs £5 from Michael Orwin, 26 Brownlow Road, Willesden, London NW10 9QL.

Roll over, Beethoven

V. HAYNET of Streatham produced an entertaining program called the **Multi-sequencer**. It has one major disadvangage — its almost incomprehensible instructions.

Once loaded, each key plays a different tune, part of a tune or sound effect. The sound effects are mainly space or laser gun-type noises and the tunes range from a bit of Beethoven to *Star Wars*. The sound quality is similar to that of a Casio-tone organ.

It is also possible to make keys play a tune of your own composition; and, if you decide the second note of *Sailors' Hornpipe* should be F sharp, it is possible to change it.

This machine code program which loads first time compares favourably to other similar programs on the market. It is available from V Haynet, 10 Ashlake Road, Streatham, London SW16.

dk'tronics ZX 80/81 SPECTRUM Hardware Software

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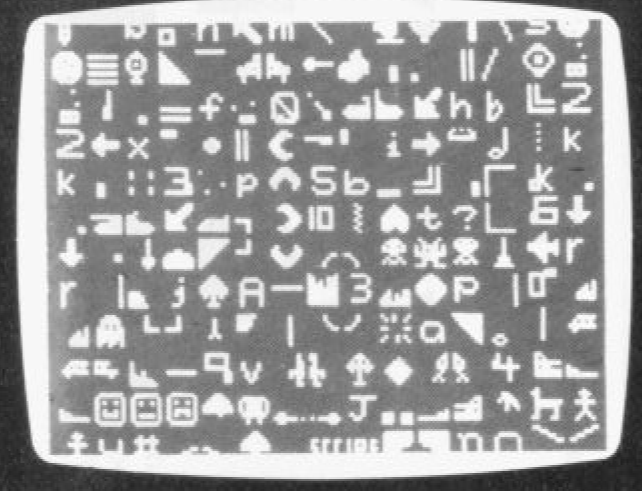
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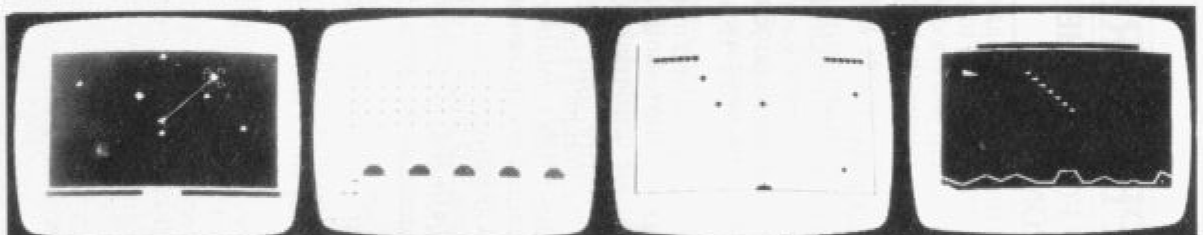
The DK Graphic module is our latest ZX81 accessory. This module, unlike most other accessories fits neatly inside your computer under the keyboard. The module comes ready built, fully tested and complete with a 4K graphic ROM. This will give you an unbelievable 448 extra pre-programmed graphics, your normal graphic set contains only 64. This means that you now have 512 graphics and with their inverse 1024. This now turns the 81 into a very powerful computer, with a graphic set rarely found on larger more expensive machines. In the ROM are lower case letters, bombs, bullets, rockets, tanks, a complete set of invaders graphics and that only accounts for about 50 of them, there are still about 400 left (that may give you an idea as to the scope of the new ROM). However, the module does not finish there; it also has a spare holder on the board which will accept a further 4K of ROM/RAM. This holder can be fitted with a 1K/2K/RAM and can be used for user definable graphics so you can create your own custom character sets.

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All games need a ZX81 with 16K Ram.

1. MAZOGS. (Bug Byte). £9.95. "Great," said Popular Computing Weekly "a grossly addictive game." We agree. It's a maze game with great graphics. You'll really feel you're running through the maze, sword in hand. 3 different variations on this one tape. Great value.

2. ZUCKMAN. (D.J.L.) £5.95."Very user-friendly...a fast and interesting game." (Sinclair User). A very good version of the famous arcade game. If you're skillful, your name and score are displayed in the Zuckman Hall of Fame for your friends to admire.

3. 3D MONSTER MAZE. (J.K. Greye). £4.95. "The graphics are incredible...and the game is very good indeed." (ZX Computing.) Until you've seen the full-screen tyrannosaurus rex chase you through his 3-D maze, you won't believe it either.

4. 3D DEFENDER. (J.K. Greye). £4.95. "Amazing 3-D graphics effects are created as the enemy draws closer...another winner." (Sinclair User). Watch through your spacecraft windows as the alien craft attack in astonishing 3-D detail.

5. TRADER. (Pixel) **£10.50** The most astonishing graphics as you travel round 6 planets. This is a 48K game but only needs 16K Ram. The print-out alone is 6½ metres long! Usually starts with a 25-second Test load.

6. THE ZX ARCADE PACK. (Control technology). £4.95. A brilliant collection of fastmoving machine code arcade games. Two kinds of invaders, one traditional, the other swooping, soaring Galaxians. Plus 6 more games, including a great graphic. Astonishing value.

7. VOLCANIC DUNGEON. (Carnell). £4.50. One of the great adventure games. Rescue the princess, if you can. It took us 3 months – and we never got bored... Fast, single-key entry: map included. PLUS a good graphic HANGMAN game: 400 word vocabulary (or enter your own words). Our children's favourite.

8. THE DAMSEL AND THE BEAST. (Bug Byte). £6.50. Another exciting adventure. Find the damsel, then kill the beast (club and torches provided), lead the damsel out before she starves. But wait until she screams... 3 game variations.

9. ZX OTHELLO. TM (M.o.I) £6.95. "Recommended without reserve... it is a superb opponent." (Your Computer). The classic board game in its very best computer form. You'll see plenty of 'Reversi' listings, but this program makes it as challenging as chess.

10. ZX CHESS II. (Artic). £9.95. "The seemingly impossible has happened – you can play high resolution chess on a Sinclair." (Card V.G.) The strongest ZX81 Chess Game around. All legal moves: 32 opening moves: 7 play levels – 4 within competition time limits. (Full Board Graphics available with Quicksilva CHR Board).

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Sound booster for Spectrum

THE TELESOUND 82 audio modulator by Compusound can make a great difference to the Spectrum. The Spectrum has a built-in loudspeaker but the reproduction can be so faint that it cannot be heard except in a very quiet room. The Telesound 82 amplifies the sound by sending it with the video signal to the TV set, where the amplifier and loudspeaker can make that small sound deafening.

All sounds produced by the loudspeaker can be reproduced, from the BEEP command to the click sound emitted from every key. There are only two connections to make inside the Spectrum, one to each of the two wires going into the video modulator, and that is achieved by crocodile clips.

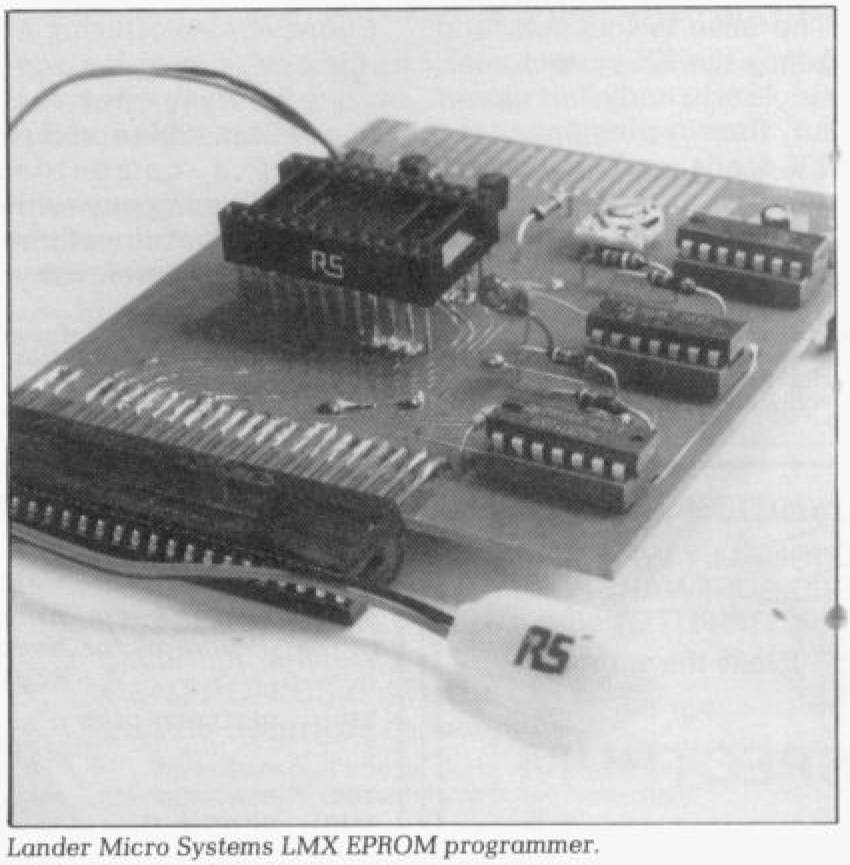
The jack plug provided is then plugged into the EAR or MIC socket and the unit is in use. You can obtain the Telesound 82 from Compusound, 32 Langley Close, Redditch, Worcs., price £9.95.

Haven has 16 colours

HAVEN HARDWARE has produced a colour board for the ZX-81 which can provide up to 16 colours for each of the character squares. The colours are POKEd into the top part of the 16K memory into 1K of on-board memory which retains the colour.

The position in memory varies with the movement display file and so must be calculated every time it is POKEd.

Only one internal connection has to be made, as all the other signals are obtained from the expansion connector. More details can be obtained from Haven Hardware, 4 Asby Road, Asby, Workington, Cumbria CA14 4RR. The cost of the colour board is £39.95 as a kit and £49.95 as a ready-built unit. All prices include VAT and postage.



Lander Micro Systems LMX EPROM programmer.

Video inverter rests on VLA

D FRITSCH has produced a video inverter kit for the ZX-81 which rests on the ULA and it requires only four connections to the ZX-81. Two of those connections are made to the power supply and the other two are obtained by soldering a wire to each side of a break which is made in the video lead going into the video modulator.

The video signal is also made sharper on the TV screen by the use of an amplifier instead of the usual integrated circuit gates. A switch is provided — with a template for cutting the hole in the back of the ZX-81 — for switching between normal and inverse video as the tape LOADing and SAVEing cannot be seen so clear in inverse video.

The price in kit form is £4 and for £7.50 the unit will be fitted to your ZX-81 for you, including VAT and postage. Contact D Fritsch at 6 Stanton Road, Thelwall, Warrington, Cheshire WA4 2HS.

Programmer for EPROM

LANDER Micro Systems has produced an EPROM programmer for the ZX-81, called the LMX. Using a printed circuit board which plugs into the back of the ZX-81, the programmer can be used as an EPROM card containing 2K of pre-programmed memory (ROM) or to re-program a 2716-type EPROM.

To re-program an EPROM it first has to be treated with ultra-violet light to clear all the bits to 1s. It is then inserted into the board and a 36V supply made up from four PP3 batteries — not provided — applied.

A special keyboard overlay and program tape is provided which will allow you to step through the addresses in the EPROM and change them. The device covers the whole of the 8K-16K memory space. The LMK system as a kit costs £17.50 including post and VAT from Lander Micro Systems, 32 Clockhouse Lane, Collier Row, Romford, Essex RM5 3QJ. Tel: Romford 26325.

Toolkit from Orme

ORME ELECTRONICS has a 2K EPROM which contains a Toolkit for a ZX-81. The EPROM card which takes the EPROM can be bought separately from the EPROM at £9.25. The card contains one socket for the EPROM and an extension board to plug in other equipment like the

continued on page 22





continued from page 21

16K RAM pack at the back.

The Toolkit contains routines such as re-number, block delete, hex-to-decimal conversion and vice-versa, READ-DATA and load machine code from tape.

The EPROM also contains a fast version of the games of **Life** and **Breakout.** All this costs £9.25. Contact Orme Electronics at 2 Barripper Road, Camborne, Cornwall. Cornwall.

Custom Cases packaging

CUSTOM CASES packs all your ZX-81 or Spectrum equipment into one portable briefcase, 19in. × 14in. × 4½in. The case is filled with polyurethane foam and has cut-outs for the computer, printer and RAM pack and, when it arrives, the ZX Microdrive.

The foam is covered with a red nylon finish and looks very attractive as well as useful in the aluminium-framed, plastic-covered briefcase. The case is lockable and keeps the ZX system neat, tidy and ready for use at any time by plugging-in the TV leads and the power supply.

The cost of the case is £36.95, including VAT and postage, from Custom Cases, Custom House, Britannia Road, Waltham Cross, Herts.

Cobra brings out interface

AN RS232 interface for a printer is available from a new company specialising in ZX equipment, Cobra Computer Services, at a cost of £30. It works from the ZX power pack and can be used with most RS232 printers to produce graphics and text.

Cobra is also offering a business consultancy service for those who want to use a ZX machine on the basis of a computer system. The company will be able to put together packages for users involving disc systems hi-res graphics and printers at low cost. Contact Cobra at 378 Caledonian Road, London N1 1DY (mail order only) for a brochure, enclosing a SAE.

Expansion for the Spectrum

EAST LONDON Robotics has produced a 64K add-on RAM board for a 16K Spectrum costing £50. It fits inside the Spectrum in the sockets provided for the Sinclair 32K board. The RAM is in two banks of 32K and is switched over by an OUT instruction. LEDs indicate which block is in use.

Contact East London Robotics, Finlandia House, 14 Darwell Close, East Ham, London, for your 80K Spectrum. Tel: 01-471 3308.

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All these routines are in machine code for SUPER-FAST response! GRAPHICS TOOLKIT uses only 2K of your RAM and that includes space to load the programmer's TOOLKIT described below.

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As reviewed in 'ZX Computing' August/Sept '82

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As reviewed in 'Your Computer' March 82

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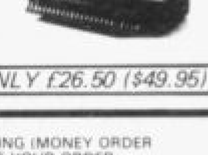
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Come to the ZX-81 with a clear mind to make the best use of your new machine.

A lifetime's obsession can easily be acquired

BUYING a ZX-81 can be the start of a lifetime obsession with home computing. It is easy, however, to become discouraged if everything does not go to plan from the beginning.

For those with only a little knowledge of computers and their capabilities, the best way to approach the ZX-81 is to abandon any ideas for special uses. While the basic machine is ideal for learning how to use computers, it is too small for any major uses. It is better to become accustomed to the many facilities and then decide how you wish to use them.

Begin by unpacking the machine, overcoming your surprise at its size and weight and, following the manual, set up the system. If you cannot get the K on the screen, check that everything is plugged into its correct socket and re-set the machine by pulling-out the power plug for a second and try tuning-in again. If still nothing appears, check the power supply unit by shaking it. If it rattles, return it. If it is satisfactory, check your system with that of a friend.

Once the K appears you are ready to begin learning about the ZX-81. It can save family arguments if you can afford a separate television set for your system. It also makes life easier if you can find somewhere to leave your equipment set up permanently. You will find that a few power sockets are needed and a four-way block connector on a short length of extension cable will help to tidy trailing leads. The manual is written in great detail and is reasonably easy to follow. Some of the chapters may not seem immediately relevant but it is worthwhile reading them as you might miss something which is important.

Patience is needed at that stage to learn the ways in which the computer will accept information. It is tempting to try to enter programs before you are really ready but that is likely to lead to errors. For example, words like AND, THEN, and AT should not be typed-in letter by letter. By the time you have reached chapter 11, you should have accumulated sufficient knowledge to be able to type-in other people's programs, such as those in *Sinclair User* and *Sinclair Programs*, without too much difficulty.

It is important that when using the machine it is not jolted. Some of the connections can easily work loose and everything which has been put in will be lost.

The manual is not to everyone's taste and if you find it difficult to follow, a number of books on the market can help you. Find the one which suits you best.

As a way of relaxing, you can buy some of the growing range of commercially-produced software. That can be loaded directly from cassette but make sure that your machine is big enough to take the tapes you buy. There are some programs for the unexpanded 1K machine but most of them require a 16K RAM pack. The tapes vary in quality. It is advisable to read the reviews in *Sinclair User* and use your judgment to find the best.

An alternative method to learn about the ZX-81 is to plunge in at the deep end and see what the computer will do. Refer to the manual when you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to obtain the feel of the machine.

You may have heard already about the problem involved in SAVEing and LOADing your own cassettes. The manual again gives detailed instructions but many of the early machines would not accept tapes from some recorders. That problem is said to have been overcome but there can still be difficulties.

They usually occur when LOADing tapes recorded by other people. One simple method to overcome this is to wind the tape to the middle of the program and type LOAD" " followed by NEWLINE; then slowly increase the volume of the recorder with the tape running until the television screen shows four or five thick horizontal black bands. If you then re-wind the tape, the program should LOAD normally.

Finally, a health warning. Apart from any practical uses, computing with your ZX-81 can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning, thinking that in another five minutes you will sort out the problem.

Try to break that habit by getting into the fresh air and meeting other Sinclair users.

By obtaining a ZX-81 you find that you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have difficulties.

Make sure of your regular copies of *Sinclair User* and *Sinclair Programs* and you can be guaranteed many happy hours with your Sinclair machine.

PROGRAM PRINTOUT

MINE FIELDS



FORMULA ONE racing drivers might be able to handle our **Minefields** game for the 16K ZX-81. Your mission is to steer across 10 minefields at a dizzying speed using cursor keys 6 and 7. Cross a field successfully and you will find that your next trip will be more difficult.

We found ourselves out of breath after every excursion, because of the speed or because we were destroyed. Perhaps a little PAUSE somewhere.

Submitted by D G Lomas of Dukinfield, Cheshire.

```
   1 LET S=0
   2 LET H=0
   5 LET P=10
   6 LET P1=10
   8 FOR U=1 TO 10
   9 CLS
  10 FAST
  15 FOR I=1 TO H+100
  20 PRINT AT INT (RND*22),INT (
RND*29)+3;"▒"
  30 NEXT I
  35 SLOW
  40 PRINT AT P,0;"▓"
  41 FOR I=1 TO 20
  42 NEXT I
  45 PRINT AT P,0;" "
  50 FOR T=0 TO 31
  55 LET H=H+1
  60 LET P=P+(INKEY$="6")-(INKEY
$="7")
  70 LET P=P+(P<0)-(P>21)
  80 PRINT AT P1,T-1;" "
  90 PRINT AT P,T;
 100 LET K=PEEK (PEEK 16398+256*
PEEK 16399)
 110 IF K=128 THEN GOTO 150
 120 PRINT AT P,T;"▓"
 130 LET P1=P
 140 NEXT T
 141 PRINT AT 10,2;"WELLDONE YOU
 HAVE SURVIVED"
 142 PRINT AT 11,5;"ON MINE FIEL
D ";U
 143 FOR O=1 TO 150
 144 NEXT O
 145 NEXT U
 146 GOTO 200
 150 FOR R=1 TO 15
 155 PRINT AT P,T;"▒"
 158 PRINT AT P,T;"$"
 159 NEXT R
 160 PRINT AT P,T;" "
 170 PRINT AT 10,5;"YOU HAVE BEE
N DESTROYED"
 172 PRINT AT 11,5;"ON MINE FIEL
D ";U
 175 LET S=S+1
 180 FOR Y=1 TO 150
 190 NEXT Y
 195 NEXT U
 200 CLS
 202 LET A$="S"
 205 IF S=1 THEN LET A$=""
 210 PRINT AT 10,0;"YOU HAVE HIT
 ";S;" MINE";A$
 215 LET D=H-(S*5)
 220 PRINT AT 15,0;"YOUR SCORE I
S ";D
 230 PRINT AT 18,3;"DO YOU WISH
TO GO AGAIN?"
 240 IF INKEY$="" THEN GOTO 240
 250 IF INKEY$="N" THEN STOP
 260 GOTO 1
```

FERRY



IF THE TEST of a good program is that we cannot tear ourselves away to write the review, **Ferry** passes. It is not a complicated routine but the cursor keys produce such an instantaneous reaction that the game has a strange hypnotic fascination of its own.

The display shows one port at the top and three at the bottom. One point is awarded for each round trip and an extra ship once all the cargo — 12 loads — is transported successfully. Control the ferry with keys 5 and 8, and do not go back to an emptied quay. Sent by Michael Simmonds for the 16K ZX-81.

Graphics notes:
80 — Graphic 4.
135 — Graphic 8, inverse space.

```
  10 LET T=2
  20 LET X=0
  30 LET T=T+1
  40 LET G=25
  50 LET B=4
  60 LET C=B
  70 LET D=C
  80 LET F$="▪"
  90 LET E=25
 100 LET B$="■■■■■"
 110 LET C$=B$
 120 LET D$=B$
 125 CLS
 130 IF B=0 AND C=0 AND D=0 AND
T>0 THEN GOTO 30
 135 PRINT TAB 0;T;TAB 14;"■";T
AB 25;X
 140 PRINT AT 1,15;F$;AT 20,3;F$
;AT 20,13;F$;AT 20,25;F$
 150 PRINT AT 21,3;B$( TO B);AT
21,13;C$( TO C);AT 21,23;D$( TO
D)
 165 LET E=INT (RND*50)+1
 170 FOR Z=40 TO 2 STEP -1
 180 IF INKEY$="5" THEN LET E=E-
1
 190 IF INKEY$="8" THEN LET E=E+
1
 200 PLOT E,Z
 210 NEXT Z
 230 IF E=6 THEN LET B=B-1
 240 IF E=26 THEN LET C=C-1
 250 IF E=46 THEN LET D=D-1
 255 IF B=-1 OR C=-1 OR D=-1 THE
N GOTO 325
 260 IF E=6 OR E=26 OR E=46 THEN
 GOTO 263
 262 GOTO 330
 263 LET G=INT (RND*50)+1
 265 FOR Y=2 TO 40
 270 IF INKEY$="5" THEN LET C=G
1
 280 IF INKEY$="8" THEN LET G=G+
1
 290 PLOT G,Y
 295 NEXT Y
 300 IF G=30 THEN GOTO 315
 310 GOTO 330
 315 LET X=X+1
 320 GOTO 125
 325 IF B=-1 THEN LET B=0
 326 IF C=-1 THEN LET C=0
 327 IF D=-1 THEN LET D=0
 330 PRINT AT 10,16;"CRASH"
 341 LET T=T-1
 343 FOR P=1 TO 50
 344 NEXT P
 346 IF T=0 THEN CLS
 351 IF T=0 THEN PRINT "GAME END
ED.SCORE= ";X
 353 IF T=0 THEN GOTO 1000
 360 GOTO 125
1000 PRINT "AGAIN(Y/N)"
1020 LET Q$=INKEY$
1030 IF Q$="N" THEN STOP
1040 IF Q$="" THEN GOTO 1020
1050 RUN
```

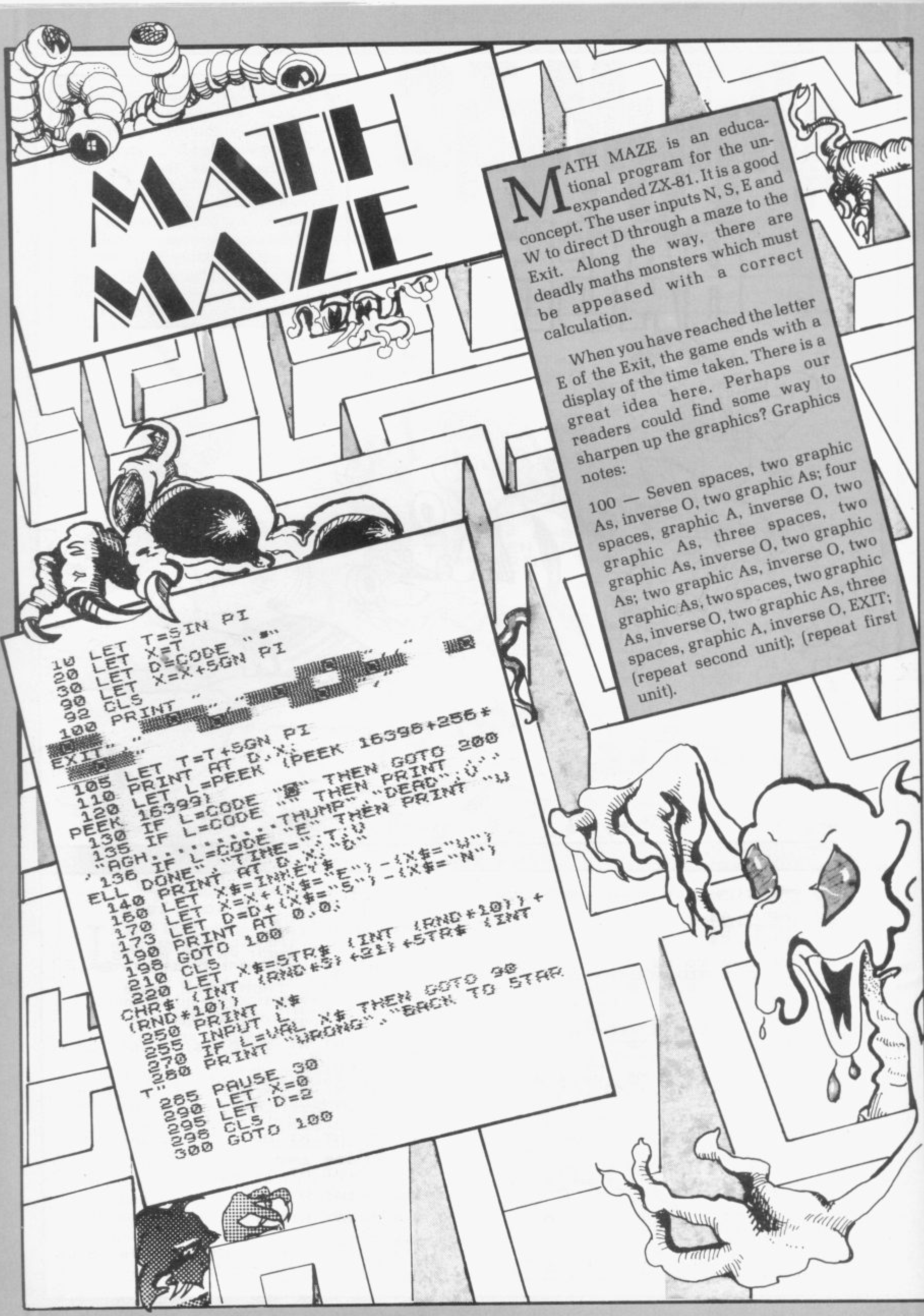
ARITHMETIC RACE

CHILDREN will love **Arithmetic Race** and teach themselves to add in the process. It is an educational game for three children which challenges them to race against each other across the screen. Each correct answer advances their asterisk one place.

Seasoned programmers might try tightening the listing and perhaps adding a few extra graphics. Sent by Janet Whittaker of Bilsborrow, near Preston for the 16K ZX-81.



```
  10 PRINT "HELLO.WHAT ARE YOUR
NAMES?"
  20 INPUT A$
  30 INPUT B$
  40 INPUT C$
  50 CLS
  60 FOR D=0 TO 31
  70 FOR E=3 TO 15 STEP 6
  80 PRINT AT E,D;"▒"
  90 NEXT E
 100 NEXT D
 110 FOR D=0 TO 31
 120 FOR E=4 TO 16 STEP 6
 130 PRINT AT E,D;"▒"
 140 NEXT E
 150 NEXT D
 160 PRINT AT 3,0;"■";AT 4,0;"■"
;AT 9,0;"■";AT 10,0;"■";AT 15,0;
"■";AT 16,0;"■"
 170 LET S=0
 180 LET T=0
 190 LET U=0
 200 LET Z$=A$
 210 GOSUB 500
 220 IF K=J THEN LET S=S+1
 230 IF K=J THEN PRINT AT 3,S-1;
"▒";AT 4,S-1;"▒";AT 3,S;"■";AT 4
,S;"■"
 240 IF S=31 THEN GOTO 1000
 250 LET Z$=B$
 260 GOSUB 500
 270 IF K=J THEN LET T=T+1
 280 IF K=J THEN PRINT AT 9,T-1;
"▒";AT 10,T-1;"▒";AT 9,T;"■";AT
10,T;"■"
 290 IF T=31 THEN GOTO 1000
 300 LET Z$=C$
 310 GOSUB 500
 320 IF K=J THEN LET U=U+1
 330 IF K=J THEN PRINT AT 15,U-1
;"▒";AT 16,U-1;"▒";AT 15,U;"■";A
T 16,U;"■"
 340 IF U=31 THEN GOTO 1000
 350 GOTO 200
 500 LET G=INT (RND*20)
 505 LET H=INT (RND*20)
 510 LET J=G+H
 520 PRINT AT 19,0;Z$;",WHAT IS
";G;" + ";H;" ?"
 525 INPUT K
 530 IF K=J THEN GOTO 560
 540 IF K<>J THEN PRINT AT 20,0;
"NO.THE ANSWER IS ";J;".YOU CANN
OT  MOVE THIS TIME"
 550 GOTO 565
 560 PRINT AT 20,0;"YES.YOU CAN
MOVE ON."
 565 PAUSE 100
 570 PRINT AT 19,0;"
"
 580 PRINT AT 20,0;"
"
 590 PRINT AT 21,0;"
"
 600 RETURN
1000 PRINT "WELL DONE.YOU HAVE W
ON THE      ADDITION RACE"
1010 STOP
```



MATH MAZE

MATH MAZE is an educational program for the unexpanded ZX-81. It is a good concept. The user inputs N, S, E and W to direct D through a maze to the Exit. Along the way, there are deadly maths monsters which must be appeased with a correct calculation.

When you have reached the letter E of the Exit, the game ends with a display of the time taken. There is a great idea here. Perhaps our readers could find some way to sharpen up the graphics? Graphics notes:

100 — Seven spaces, two graphic As, inverse O, two graphic As; four spaces, graphic A, inverse O, two graphic As, three spaces, two graphic As, inverse O, two graphic As; two graphic As, inverse O, two graphic As, two spaces, two graphic As, three spaces, graphic A, inverse O, EXIT; (repeat second unit); (repeat first unit).

```
10 LET T=SIN PI
20 LET X=T
30 LET D=CODE "■"
90 LET X=X+SGN PI
92 CLS
100 PRINT "…"
EXIT"…"
105 LET T=T+SGN PI
110 PRINT AT D,X;
120 LET L=PEEK (PEEK 16398+256*
PEEK 16399)
130 IF L=CODE "■" THEN GOTO 200
135 IF L=CODE "." THEN PRINT
,"AGH.........THUMP","DEAD";U
136 IF L=CODE "E" THEN PRINT "W
ELL DONE","TIME=";T;U
140 PRINT AT D,X;"D"
150 LET X$=INKEY$
160 LET X=X+(X$="E")-(X$="W")
170 LET D=D+(X$="S")-(X$="N")
173 PRINT AT 0,0;
190 GOTO 100
198 CLS
210 LET X$=STR$ (INT (RND*10))+
CHR$ (INT (RND*5)+21)+STR$ (INT
(RND*10))
220 PRINT X$
250 INPUT L
255 IF L=VAL X$ THEN GOTO 90
270 PRINT "WRONG","BACK TO STAR
T:"
280 PAUSE 30
285 LET X=0
290 LET D=2
295 CLS
298 GOTO 100
300
```



FISHERMAN is a very straightforward game for the computer novice. It works on the unexpanded ZX-81.

You are the eponymous fisherman. Cast with key F and, if successful, continue the game with any key. From Colin Link of Rickmansworth, Herts.

10 — Space O; space, inverse space, graphic 7; graphic 3, graphic 1, graphic 5.

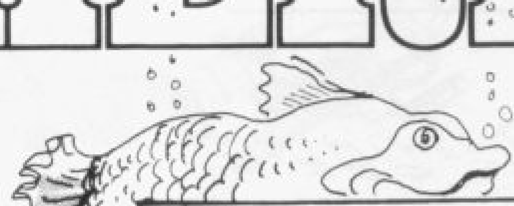
410 — Graphic 3, graphic E, three graphic spaces, graphic W, two spaces, graphic 3, inverse space, graphic 1.

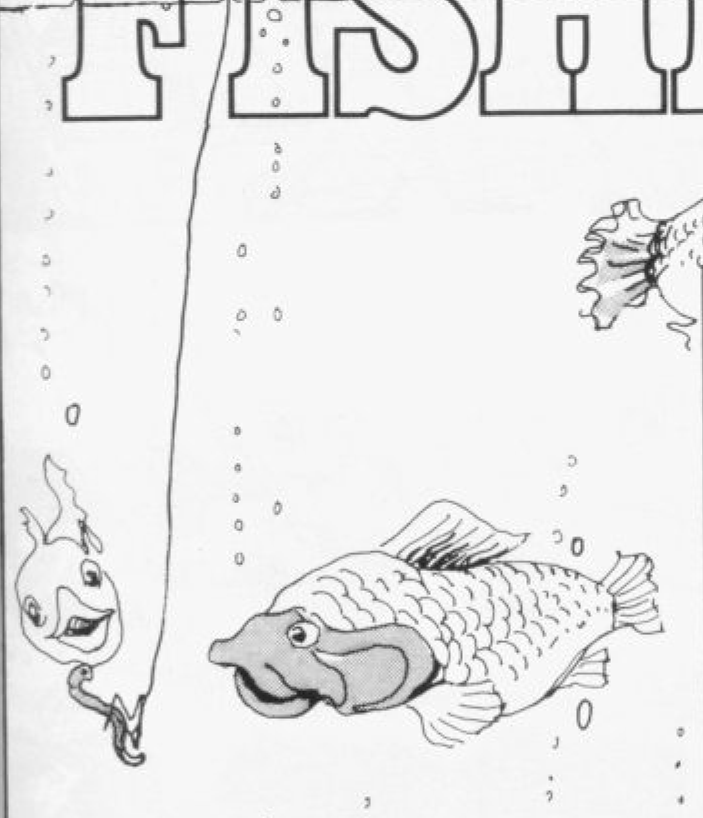
420 — Ten inverse spaces.

430 — Graphic R, nine inverse spaces.

440 — Graphic 2, inverse shifted V, three inverse spaces, two spaces, graphic 2, inverse space, graphic 4.

FISHERMAN





```
   1 LET A=INT (RND*14)+5
   2 LET B=CODE "2"
   3 LET X=B
   4 LET Y=X-X
  10 PRINT TAB Y;" O";TAB Y;" ▀▀
";TAB Y;" ▗▘"
 100 LET B=B-1
 110 PRINT AT Y,3;":"
 120 PRINT AT A,B;"O:  "
 125 IF Y=A THEN GOTO 300
 130 IF INKEY$="F" THEN LET X=Y-
Y
 140 IF NOT X THEN LET Y=Y+A/A
 150 IF B=0 THEN GOTO 220
 200 GOTO 100
 220 PRINT AT A,B;"   "
 230 LET B=CODE "3"
 240 GOTO 100
 300 IF B=VAL "2" OR B=VAL "3" T
HEN GOSUB 400
 310 IF INKEY$="" THEN GOTO 310
 320 CLS
 330 RUN
 400 PRINT AT A-A/A,B-B;
 410 PRINT "▄█████▄  ▄█▀"
 420 PRINT "██████████"
 430 PRINT "██████████"
 440 PRINT "▀█████▀  ▀█▄"
 450 RETURN
```

```
1000 LET S=0
1010 LET K$="
 "
1020 DIM B$(10,2)
1030 LET M=0
1040 LET N=0
1050 LET J=1
1060 GOSUB 1090
1070 GOTO 1230
1080 REM BATTLE SHIPS
1090 FAST
1100 REM SET UP BOARD
1110 FOR X=0 TO 16 STEP 16
1120 FOR I=4 TO 13
1130 FOR Z=2 TO 11
1140 PRINT AT I,Z+X;"."
1150 PRINT AT I,Z+X;"."
1160 NEXT Z
1170 PRINT AT I,0;TAB X;I-4
1180 NEXT I
1190 PRINT AT 3,2+X;"ABCDEFGHIJ"
1200 NEXT X
1210 SLOW
1220 RETURN
1230 PRINT AT 21,0;"TO ENTER CO-
ORDINATES PRESS N/L"
1240 INPUT Z$
1250 FOR A=1 TO 4
1260 PRINT AT 21,0;K$;AT 21,0;"E
NTER BATTLESHIP ";A
1265 INPUT B$(A)
1270 PRINT AT CODE (B$(A,2))-28+
4,CODE (B$(A,1))-38+2;"B"
1280 NEXT A
1290 FOR A=5 TO 8
1300 PRINT AT 21,0;K$;AT 21,0;"E
NTER FRIGATE ";A-4
1310 INPUT B$(A)
1320 PRINT AT CODE (B$(A,2))-28+
4,CODE (B$(A,1))-38+2;"F"
1330 NEXT A
1340 FOR A=9 TO 10
1350 PRINT AT 21,0;K$;AT 21,0;"E
NTER SUBMARINE ";A-8
1360 INPUT B$(A)
1370 PRINT AT CODE (B$(A,2))-28+
4,CODE (B$(A,1))-38+2;"S"
1380 NEXT A
1390 PRINT AT 21,0;K$;AT 21,0;"I
 WILL CHOOSE MY CO-ORDINATES"
1400 DIM A$(10,2)
1410 FOR A=1 TO 4
1420 LET A$(A,1)=CHR$ (INT (RND*
10)+38)
1430 LET A$(A,2)=CHR$ (INT (RND*
10)+28)
```

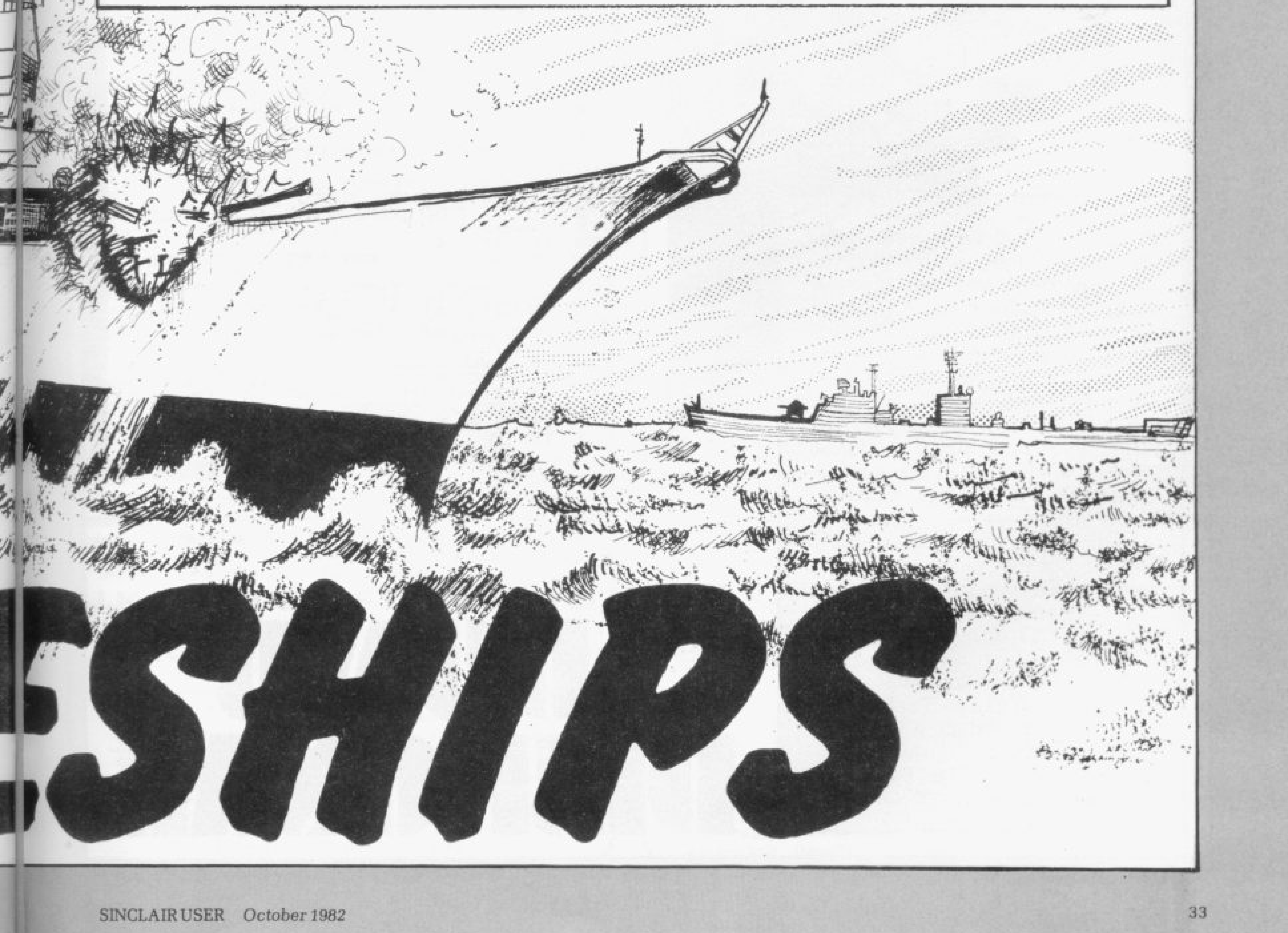
DID YOU play **Battleships** at school? Blunt pencils gripped in grubby fingers. Hands cupped around the graph paper to prevent the other fellow from cribbing.

We have an altogether more elegant way of doing things, supplied by Michael Owen of Southport, Merseyside for the 16K ZX-81. The display shows two boards, yours and that of the computer. Press NEWLINE and enter the co-ordinates of your navy, letter first. When you have finished, the screen will be modestly obscured while the machine lays out its own battle-line.

Each side then takes turns at firing three shells into the midst of the opposing armada. You do it by entering co-ordinates as above. And England expects . . .



```
1440 NEXT A
1450 CLS
1460 FOR A=5 TO 6
1470 LET A$(A,1)=CHR$ (INT (RND*
10)+35)
1480 LET A$(A,2)=CHR$ (INT (RND*
10)+28)
1490 NEXT A
1500 FOR A=9 TO 10
1510 LET A$(A,1)=CHR$ (INT (RND*
10)+38)
1520 LET A$(A,2)=CHR$ (INT (RND*
10)+28)
1530 NEXT A
1540 GOSUB 1090
1550 FOR A=1 TO 4
1560 PRINT AT CODE (B$(A,2))-28+
4,CODE (B$(A,1))-38+2;"B"
1570 NEXT A
1580 PRINT AT 0,0;"YOUR SHIPS"
1590 FOR A=5 TO 6
1600 PRINT AT CODE (B$(A,2))-28+
4,CODE (B$(A,1))-38+2;"F"
1610 NEXT A
1620 FOR A=9 TO 10
1630 PRINT AT CODE (B$(A,2))-28+
4,CODE (B$(A,1))-38+2;"S"
1640 NEXT A
1650 PRINT AT 21,0;K$;AT 21,0;"Y
OUR GO"
1660 PRINT AT 19,19;"YOU = ";S;A
T 20,20;"ME = ";M
1670 FOR B=1 TO 3
1680 PRINT AT 15,0;K$
1690 LET G=-150
1700 INPUT C$
1710 LET N=N+1
1720 FOR A=1 TO 10
1730 IF C$=A$(A) THEN GOTO 1810
1740 NEXT A
1750 PRINT AT CODE (C$(2))-28+4,
CODE (C$(1))-38+18;"+"
1760 LET K=RND**RND
1770 PRINT AT 1,15;"          "
1780 PRINT AT 1,15;"MISSED.";C$;
1790 NEXT B
1800 GOTO 1960
1810 IF G=145 THEN PRINT AT 15,0
;"I SANK YOUR ";
1820 IF G=-150 THEN PRINT AT 15,
0;"YOU SANK MY ";
1830 IF A<=4 THEN PRINT "BATTLES
HIP"
1840 IF A>=5 AND A<=6 THEN PRINT
 "FRIGATE"
1850 IF A>=9 AND A<=10 THEN PRIN
T "SUBMARINE"
1860 IF G=-150 THEN LET S=S+1
1870 IF G=145 THEN LET M=M+1
1880 IF G=-150 THEN PRINT AT COD
E (C$(2))-28+4,CODE (C$(1))-38+1
8;"H"
1890 IF G=145 THEN PRINT AT CODE
 (D$(B,2))-28+4,CODE (D$(B,1))-3
8+2;"H"
1900 IF M=10 THEN PRINT AT 20,20
;"I WIN ";V
1910 IF S=10 THEN PRINT AT 19,19
;"YOU WIN ";V
1920 IF G=-150 THEN LET A$(A)=""
1930 IF G=145 THEN LET B$(A)=""
1940 LET K=RND**RND**RND
1950 GOTO 1930+G-5
1960 PRINT AT 21,0;K$;AT 21,0;"M
Y GO"
1970 DIM D$(3,2)
1980 LET G=145
1990 FOR B=1 TO 3
2000 LET D$(B,1)=CHR$ (INT (RND*
10)+38)
2010 LET D$(B,2)=CHR$ (INT (RND*
10)+28)
2020 FOR A=1 TO 10
2030 IF D$(B)=B$(A) THEN GOTO 18
10
2040 NEXT A
2050 PRINT AT 1,15;"          "
2055 PRINT AT CODE (D$(B,2))-28+
4,CODE (D$(B,1))-38+2;"+"
2060 PRINT AT 1,15;"MISSED.";D$(
B)
2070 NEXT B
2080 PRINT AT 17,0;"          "
2090 GOTO 1650
2100 SAVE "BATTLESHIP"
2110 GOTO 1
```



```
   10 PRINT " INPUT YEAR, MONTH A
ND DAY"
   20 INPUT A$
   30 INPUT B
   40 INPUT C
   50 LET A=VAL A$(3 TO 4)
   60 LET A=A+INT (A/4)+C
   70 IF INT (VAL A$/100)=17 THEN
 LET A=A+4
   80 IF INT (VAL A$/100)=18 THEN
 LET A=A+2
   90 IF VAL A$/4=INT (VAL A$/4)
AND B<=2 THEN LET A=A-1
  100 LET A$="144025036146"
  110 LET A=A+VAL A$(B)
  120 LET A=A/7
  130 LET A=A-INT A
  140 LET A=A*7
  150 LET A$="SATSUNMONTUEWEDTHUF
RI"
  160 PRINT AT 10,10;A$(1+A*3 TO
1+A*3+2)
```

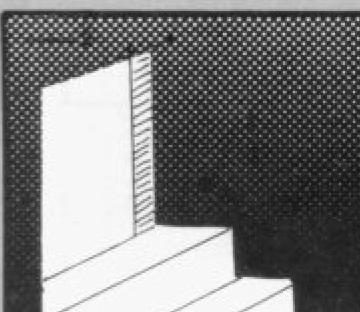


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Input the date — anything from 1752 to 1999 — and the computer will display the day of the week on which that date fell.

Calendar is the neatest program we have had on this subject, submitted by William Mitchell of Welton, Lincoln, for the unexpanded ZX-81. The programming is well worth close examination.



YOU ARE alone in your living room, your watch at the repairers, and you discover a time bomb in the cellars. You have eight minutes to defuse it.

You have a choice of different actions, each of which will take different lengths of time and give you greater chances of survival. First, you can study a **Bomb Disposal** manual. That takes one to six minutes but gives you a greater ability to narrow the choice of wires to snip. Second, you can spend one to five minutes looking for a spanner. You will have some advantage from that. Last, quickest and least useful, you can try a treble gin.

An interesting idea though it suffers from the limitations of all purely random games. Perhaps our readers can introduce a little skill into the routine.

Submitted by Tim Grubb of Leicestershire for the 1K ZX-81.

```
    1 LET M=0
    5 LET C=0
   20 PRINT "DO YOU READ THE MANU
AL?(Y/N)"
   30 INPUT U$
   40 IF U$="Y" THEN LET C=C+(RND
*6)+1
   45 IF U$="Y" THEN LET M=3
   50 PRINT "DO YOU BUY A SPANNER
?(Y/N)"
   55 INPUT O$
   60 IF O$="Y" THEN LET C=C+(RND
*5)+1
   65 IF O$="Y" THEN LET M=M+2
   67 IF C>=8 THEN GOTO 150
   70 PRINT "DO YOU SINK A TREBLE
 GIN?(Y/N)"
   80 INPUT V$
   90 IF V$="Y" THEN LET C=C+(RND
*4)+1
  100 IF V$="Y" THEN LET M=M+1
  110 PRINT "IT IS A TREMBLER SWI
TCH. WIRE 1 TO ";8-M
  112 LET A=INT (RND*8-M)+1
  115 INPUT V
  130 IF A=V THEN PRINT AT 10,10;
"BOMB DISPOSED"
  140 IF A<>V THEN PRINT AT 10,4;
"WRONG WIRE...BOOM"
  150 IF C>8 THEN PRINT AT 10,5;"
TIME IS UP...TICK BOOM"
```



BOMB DISPOSAL

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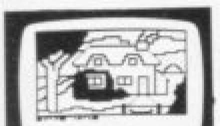
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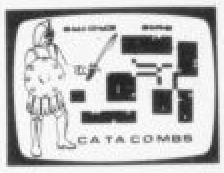


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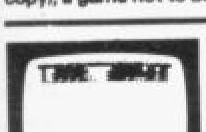




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A SMASH HIT at the ZX Microfair (most of the other software houses wanted a copy), a game not to be missed!





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Mike Salem considers the problems of keeping information on cassettes

Finding better ways of storing on tape

THE USE of tape recorders with microcomputers is fraught with difficulties. All can be overcome, so that reliable loading and saving become routine. The tape storage and retrieval systems of all microcomputers are designed with mono portable cassette recorders in mind. What are the problems, why do they occur, and how can they be solved?

The metal head of a tape recorder has an almost invisible vertical gap in its structure. The gap is what magnetises the tape, when recording, and picks up the signal — when playing back. The gap should be truly vertical to allow interchangeability of tapes.

If tapes were always to be played back on the recorder on which they were made, it would be necessary only for the gap to be in the same orientation for both recording and playback. This would always be so if the head was never re-aligned. That is why many people can load their own programs but not anyone else's.

To use a tape recorder with programs from different sources it is imperative that the gap be very close to true vertical. This problem can be solved by having the head gap angle adjusted correctly. The way to set up a gap is to measure the output from a special test tape with an audio voltmeter, adjusting the head for best output. That is called azimuth alignment. Many tape recorders — including, surprisingly, some very expensive hi-fi machines — have poorly-aligned heads. That will cause some loss of treble, which may not be noticed on a machine with a cheap loudspeaker, with audio signals; it may cause a computer signal to fail to load entirely.

Almost all cheap mono portables have an automatic level control circuit. That circuit sets the recording level to give a reasonable output level for a very wide range of inputs. If you record a concert from near the back seat, the sound of the orchestra will be almost as loud as if you were at the front, without you making any adjustments — background noise will be more noticeable.

ALC circuits are designed for voice and music; some ALC circuits never have the recording level absolutely correct and 'fiddle' with it all the time when computer signals are used. Technically, the ALC control loop hunts. That produces a tape with fluctuating volume which may be difficult or impossible to load. You cannot blame the manufacturer of either the tape recorder or the computer — they are not compatible.

That kind of behaviour is not correlated with price or quality; the problem cannot be solved — use a different recorder. Detection is not easy — an oscilloscope can be used by the technically-minded; otherwise use a recorder known to be suitable.

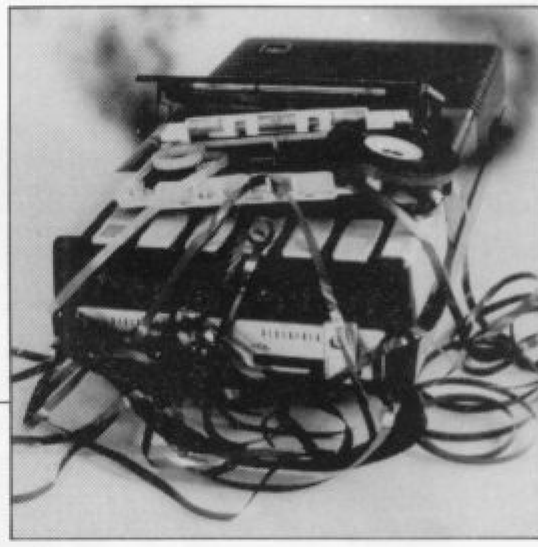
Dirty heads can be a problem. Various cleaning tapes and fluids are marketed. Rather shamefacedly, we must confess to doing no more than giving heads an occasional wipe with a dry handkerchief before they become caked.

Some machines will work with batteries but not SAVE loadable programs when running from mains. Those machines may also produce audible hum. Batteries, of course, gradually drop in voltage with deleterious effect on tape speed and signal level. Solutions are to use reasonably fresh batteries only, or use machines which operate reliably from the mains.

> 'The systems are designed with mono portable cassette recorders in mind'

Machines with stereo heads should not, in general, be used. If they must be used, use single track, rather than two-track-in-parallel mono mode. Stereo machines have

continued on page 38



continued from page 37

two head gaps, which should be aligned vertically. If the gaps are offset by a few micrometres relative to each other, the effect in mono mode is similar to a head with poor azimuth alignment.

As stereo head gap offset is not a figure which is specified by manufacturers — it is irrelevant to stereo operation — not even the best recorders can be guaranteed free of this problem.

Head wear can be a significant problem. It can even be significant in a machine used heavily for computing only. On machines much-used for general purposes, head wear should be watched for. The symptoms occur gradually and may be missed.

Performance deteriorates gradually. Bad head wear can be seen — the working part of the head becomes visibly concave, instead of following the convex curvature of the rest of the head.

In some cases — ZX-81 in particular — program corruption may occur; that is worse than straightforward failure to load, as it may be missed, and corrupted versions of the programs and data can gradually replace out-of-date, but correct, versions.

If you are technically-minded, you may be able to buy, for about £3, a replacement head. Otherwise it may be more cost-effective to buy a new recorder. Keep it for computing only, which will prolong head life.

It is worth noting that head wear shows on cassettes with foam rubber — usually dark — pressure pads long before it affects the use of cassettes with felt — usually light-coloured — pressure pads. What you may gain on the swings you lose on the roundabouts. Of course, felt pressure pads wear heads faster than foam ones. Nonetheless, we prefer felt.

Once you have a suitable tape recorder, you should be able to SAVE and LOAD your tapes without trouble. If you always use the same brand of tape, recorder and computer, you should always be able to work at the same volume control setting when loading — volume control setting is ignored by all tape recorders with ALC when SAVEing.

Loading other people's tapes is more of a problem, due to differing recording levels, quality of machines and azimuth alignment. The level-setting problem is easily solved by using a suitable monitoring device. An ordinary AC voltmeter can be used but is not ideal.

A purpose-designed loading aid is available from Hilderbay Ltd. If it is desperately important to load a tape, it is possible to mis-align your head azimuth temporarily to match the bad tape, but do not forget to put it back the way it should be. A final trick which has been known to work with tapes with a good deal of hum is to use a machine with a poor bass response. The cheaper machines are better at that.

'Loading other people's tapes is more of a problem, due to differing recording levels, machine quality and azimuth alignment'.

Standard audio tape of good quality is satisfactory. Only uniformity and adherence of coating matter — noise, frequency response are unimportant. The shorter the better, all else being equal. TDK D-C46 is good.

A few comments on the use of tape recorders and tape:

- If you can save and load your own tapes but cannot load anyone else's, your recorder is probably of a satisfactory type but is in need of azimuth adjustment.
- If you can load other people's tapes but not your own, your recorder is probably unsuitable.
- If the volume setting is exceedingly critical you might find it worth trying another recorder. A loading aid will be very useful.
- If performance deteriorates, or is not so good as you know your make of recorder to be capable of, the head may be worn.
- Always re-wind tapes to keep the fragile magnetic coating out of harm's way.
- Do not use the first and last 10 seconds of the magnetised part of each tape. It is far less reliable than the rest of the tape.
- The best tape for critical applications is one of good make which you have used successfully once or twice.
- Keep tapes away from magnetic fields — motors, transformers, magnets. That holds in particular when travelling by train. Problems rarely seem to happen in the post. Airport X-rays are probably not a serious problem — we do not know for sure.
- If you cannot save and load tapes with the certain knowledge that you can load them next time, you are not getting as much from your equipment as you should.

How to choose a tape recorder. First, the tape recorder must be suitable for computer use. This feature can only be tested, never predicted from a specification. If the machine is suitable, some useful features are: mains operation; a tape counter; cue and review facility — machine plays squeakily in fast forward and re-wind modes; useful for locating programs, analysing drop-outs; it should not have a tone control — most better-quality machines have a tone control; keep it set to its maximum position.

Some frills found on a few fairly expensive machines are manual level control instead of, or in addition to, ALC; a limiter circuit in addition to manual and automatic level control; a recording level meter — very useful — mainly as a sure indicator that the signal is getting through leads and connectors to the tape recorder; variable speed playback.

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Andrew Hewson.



How ZX-81 sorts out different variables

I HAVE selected just two letters this month and answered them in detail because I feel they will be of interest to everyone.

"I wish to transfer the whole of what is on the display area to a different area in memory, say at 30000, and then recall it. How can I do so?" asks Kevin Kwantes of Swansea.

The first job is to move RAMTOP down from 32768 to 30000 so that the copy of the display will not interfere with the functioning of the ZX-81. To do this enter:

```
POKE 16388, 48
POKE 16389, 117
CLS
```

A full display normally consists of 33 x 24 x 1 = 793 characters, 33 of which are the Newline character (code 118). Hence a Basic routine which transfers 793 bytes from D-FILE onwards to 30,000 will save the display. For example:

```
9010 LET D = PEEK 16396 +
   256 * PEEK 16397
9020 FOR I = 0 to 792
9030 POKE 30000 + I, PEEK
   (D + I)
9040 NEXT I
```

When recovering a previous display a little more care must be taken because if the screen has been SCROLLed the display file will be less than the full size and so it is essential to clear the screen and hence ensure that a full-size display exists before recovering the previous display. The following routine can be used:

```
9100 CLS
9110 LED D = PEEK 16396 +
   256 * PEEK 16397
9120 FOR I = 0 to 792
9130 POKE D + I, PEEK
   (30000 + I)
9140 NEXT I
```

Both these routines are slow but there is a machine code instruction called LDIR which is designed for moving blocks of data from one part of RAM to another. To use LDIR, the address to which the item is to be moved is put in the HL register pair. Then the address to which the item is to be moved is put into the DE register pair. Finally the number of bytes to be moved is put into the BC register pair and the LDIR instruction is invoked.

The following routine uses LDIR to save the display file:

Decimal	Hex	Op Code
42 12 64	2A OC 40	LD HL, (D-FILE)
17 48 117	11 30 75	LD DE, 30000
1 25 3	01 19 03	LD BC, 793
237 176	ED BO	LDIR
201	C9	RET

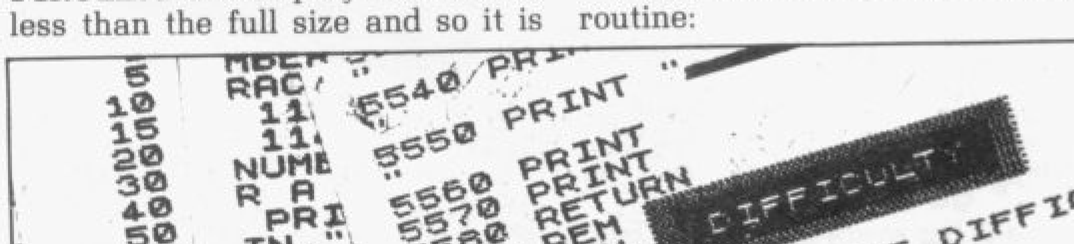
With RAMTOP set at 30000 there is plenty of room to put the routine above RAMTOP, at say 32000, by POKEing the decimal codes into each location in turn as follows:

```
POKE 32000, 42
POKE 32001, 12
POKE 32002, 64
POKE 32003, 17
etc
```

To execute the routine enter:

```
RAND USR 32000
```

To recover the display file use this routine:



Decimal	Hex	Op Code
205 42 10	CD 2A OA	CALL CLS
33 48 117	21 30 75	LD HL, 30000
237 91 12 64	ED 5B OC 40	LD DE, (D-FILE)
1 25 3	01 19 03	LD BC, 793
237 176	ED BO	LDIR
201	C9	RET

continued on page 42







continued from page 41

Notice that a call is made to the ROM routine which clears the screen. The routine can be loaded immediately after the save routine at 32012.

Keith Francis of Stamford raises an interesting question. He asks: **"If the ZX-81 uses two bytes to store line numbers, why is 9999 the largest line number permitted?"**

The question is very sensible. Each byte contains eight bits and each bit can take two values giving $2^{16} = 65536$ arrangements of the 16 bits in the two bytes. Hence the two bytes could be used to represent any positive integer between 0 and 65535 inclusive. Why limit line numbers to 9999?

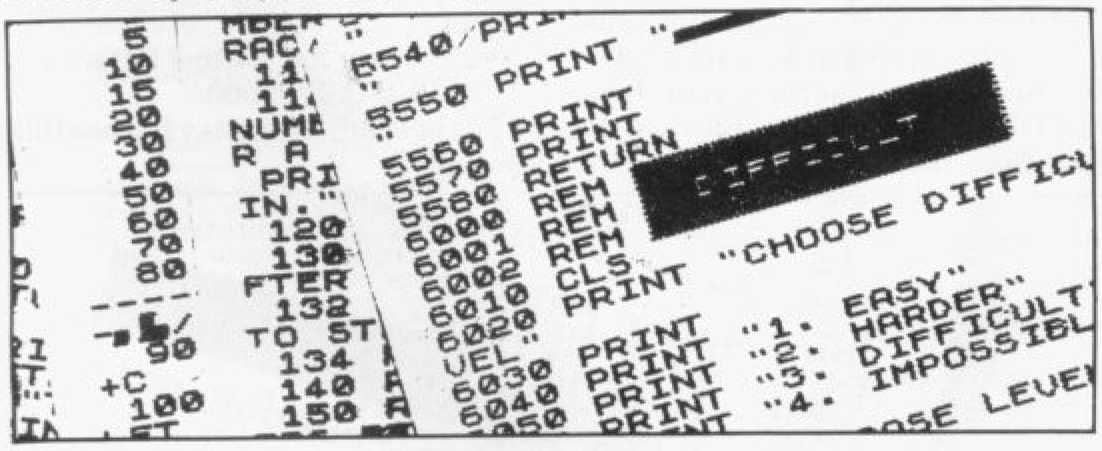
The reason is that by limiting in this way and by manipulating the numeric codes for variables the ZX-81 has a device for distinguishing lines in the program area from variables in the variables area.

To understand the mechanism at work, consider the representation of 9999. Line numbers are held with their most significant byte first, contrary to the usual Z-80 convention, so that line number 9999 is held as a byte containing 39 followed by a byte containing 15 because 39*256 + 15 = 9999. The bit pattern of the first byte, obtained by converting 39 to binary, is 00100111. Notice that the three most significant bits — bit numbers 7, 6 and 5 are set to 0, 0 and 1 for this, the largest permitted line number. Hence bit numbers 7, 6 and 5 of the first byte of all permitted line numbers will be set to 0, 0 and 1, or in the case of line numbers less than 8192, they will be set to 0, 0, 0.

Now look at pages 172 to 174 of the ZX-81 Basic Programming manual and you will see illustrations of the different types of variables as they are represented in the variables area. In each case the first byte contains a numeric code related to the code of the letter; in the case of a number whose name is longer than one letter, the first letter, which identifies the variable. The largest possible letter code is 63, the code for Z, which is 00111111 in binary, and the smallest is 38, the code for A, which is 00100110 in binary. Clearly, bits 7 and 6 are not needed when distinguishing between letter codes and bit 5 is always set to one, so the ZX-81 uses them to distinguish between the different types of variable, subtracting 20h, or 32 in decimal, from the letter code in three of the six cases.

Three bits can be set in 2^3, or 8, different ways. The table lists the eight ways and their interpretation.

Bit pattern	Interpretation
000	Line number less than 8192
001	Line number between 8192 and 9999
010	String
011	Number with single character name
100	Array of numbers
101	Number with multiple character name
110	Character array
111	Control variable for a FOR-NEXT loop



I do not know why Sinclair should take such elaborate precautions to distinguish a line number from a variable because the same purpose could be served by comparing the address of the byte in question to the D-FILE or VARS pointers. It allows the ZX-81 to use the same routine, at 2546 to 2576, to step through memory to the "next" line or the "next" variable but that seems a small advantage.

Perhaps it is merely a hangover from the ZX-80, because in that machine the variables area follows immediately after the program area and so a device which "knows" from the contents of the byte that the end of the program has been reached serves some purpose. If any reader has a more credible explanation, I should be interested to hear it.

It is worth noting that while the ZX-81 prevents you entering line numbers greater than 9999 from the keyboard, if you manipulate the line numbers by POKEing the appropriate locations your program will still run, provided the line numbers do not exceed 16383 as the following routine demonstrates:

```
10 LET I = 10000
20 SCROLL
30 PRINT I
40 POKE 16634, INT (I/256)
50 POKE 16635, I-256*INT
   (I/256)
60 LET I = I + 1
9999 GOTO 20
```

Line numbers 40 and 50 POKE the current value of I into the locations originally occupied by 9999. If you run the program for a few cycles and then BREAK it you will see that 9999 has been updated to, say, AO29 for I = 10029. Clearly the ZX-81 does not decode line numbers greater than 9999 correctly but the result is comprehensible if you remember A follows 9 in the sequence of character codes.

If you leave the program running for long enough it will stop when I = 16384 and a LISTing will then omit the final line because the LIST command does not recognise it as a line. You can use this quirk to make programs "disappear" by POKE 16509, 64. Such "invisible" programs can be SAVEd and LOADed as usual and will RUN if 16509 is reset to its original value.

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The June competition for Spectrum and printer attracted a high standard of entries. The prize was awarded to a design which strikes good balance between hardware and software

MOS chip is used in winning EPROM blower contest

AT FIRST SIGHT, it would seem that the theme for this competition was a little out of context for a magazine such as *Sinclair User*. On closer inspection, however, it becomes clear that more and more programmers are introducing machine code into their programs whenever Basic becomes too slow in execution.

If we look at the next stage, a logical extension would be to keep a permanent copy of that useful re-number routine or perhaps that fast screen display which can be called-up in a Basic program and executed almost immediately.

Any program or routine written in main memory — or RAM — is lost whenever the computer is switched-off. To keep a permanent copy of a program we can either record it on cassette — or backing store — or we can copy it into a memory chip which keeps its contents intact even after power has been removed.

```
 100 PRINT "WHAT ADDRESS IN THE
EPROM"
 110 INPUT Y
 120 REM 3 MSB NEED TO BE A LOGI
C 1
 130 LET Y=Y+57344
 140 POKE 16514,Y-256*INT (Y/256
)
 150 POKE 16515,INT (Y/256)
 160 PRINT "ENTER NO OF BYTES TO
 BE SENT"
 170 INPUT A
 180 DIM B(A)
 190 FOR C=1 TO A
 200 INPUT A(C)
 210 PRINT B(C)
 220 NEXT C
 230 FOR C=1 TO A
 240 POKE 16516,B(C)
 250 LET S=USR 16516
 260 IF PEEK PEEK 16517 THEN GOT
O 1000
 270 LET Y=Y+1
 280 POKE 16514,Y-256*INT (Y/256
)
 290 POKE 16515,INT (Y/256)
 300 NEXT C
 310 PRINT "JOB FINISHED, NO ERR
ORS"
 320 PRINT "DO YOU REQUIRE TO PR
OGRAM MORE DATA IN"
 330 INPUT Z$
 340 IF Z$="Y" THEN GOTO 100
 350 STOP
1000 PRINT "ERROR HAS OCCURRED"
1010 LET Y=Y-57344
1020 PRINT "ERROR OCCURRED AT";Y
1030 PRINT "DATA READ FROM THIS
LOCATION IS ";PEEK 16517
1040 STOP
```

That type of memory chip is called a ROM, which stands for read-only memory. An 8K ROM is used in a ZX-81 to store the Basic interpreter and operating system.

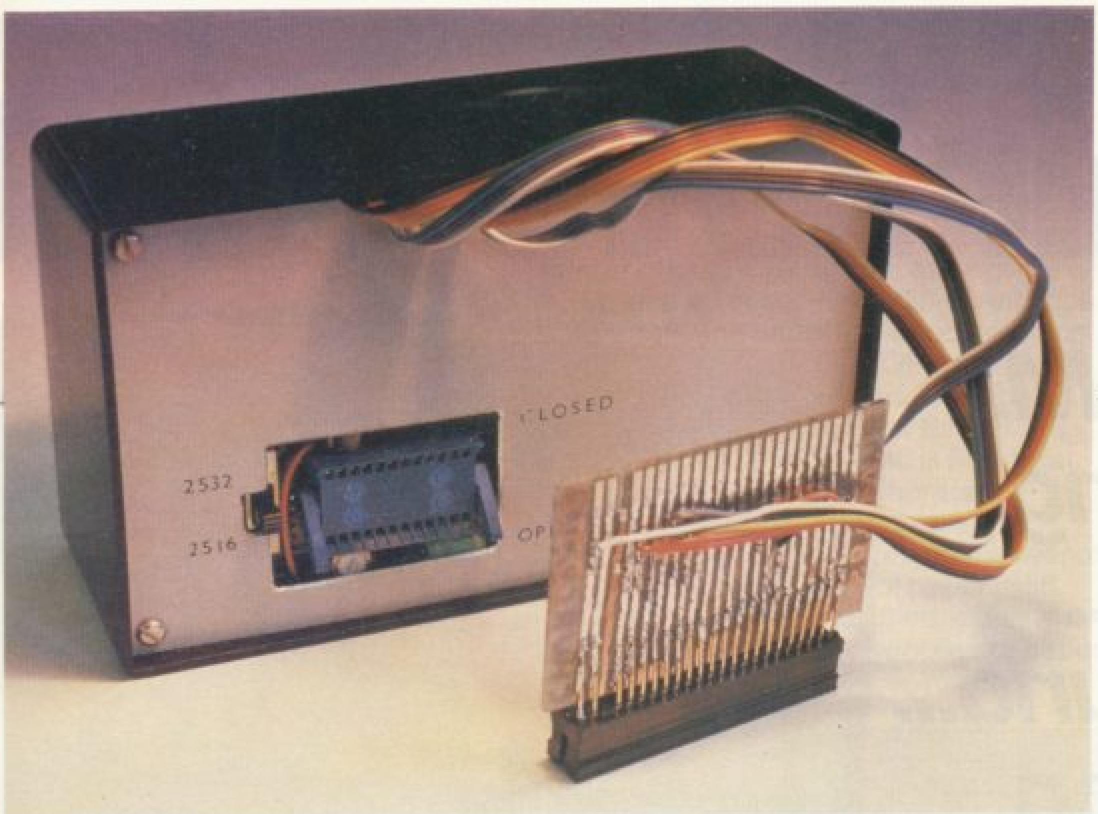
A disadvantage, so far as the experimenter is concerned, with a ROM is that once it has been programmed it is impossible to change. There is also available an erasable programmable read-only memory, or EPROM, which caters for such needs.

That was the idea of the competition, to design an EPROM blower which could be produced cheaply, work on a ZX-81 and allow the other Sinclair peripherals, such as the 16K memory and printer, to be used with it.

The response was very favourable and illustrated the wide variety of backgrounds of readers. It was most encouraging to see entries from school pupils with limited resources but nevertheless original ideas.

The winner of the competition was Stephen Churchman, of Blandford Camp, Dorset, who designed and built a prototype which performed very well. His design struck a good balance between the hardware used and the driving software. The documentation contained good, clear diagrams, the main one of which is shown and which should be possible to follow by an amateur.

The text accompanying the entry was well-written and included a Basic listing, shown, which not only programmed the EPROM but also checked the contents of each memory location after programming. If the memory contents of the



made, since the unit was completely self-contained, including the power supply.

There is no doubt that the biggest impact that computers will have in the future is in the area of process control. There is therefore a need to design small systems capable of executing a given sequence of instructions without further attention from human operators.

The set of instructions must, of course, be tested thoroughly to account for every likely event, but once that has been done, the program needs to be stored in some convenient package which is both reliable and cheap.

An EPROM fits those requirements and the fact that a hobbyist can experiment with work of this nature on an inexpensive ZX-81 is a very positive recommendation to the further development of this work.

The range of entries received has proved that there is a great deal of enthusiasm and dedication among readers of *Sinclair User*. It was a tall order to produce a working prototype in the time allowed but it has been proved possible. Now, what can be done for the Spectrum?

EPROM differ from those sent to it, an error message is issued giving the exact memory location of the error.

The design catered for the Texas Instruments 2516 EPROM as well as the 2532. A word of explanation is needed on EPROM specification. Like RAM chips, there are various types of EPROM chips available which differ in memory size and power requirements. There are two categories of power requirements, namely those requiring three voltage supplies — + 12V, -12V and + 5V — and those needing only a single power supply — + 5V.

The most popular type of EPROM used is a 2K × 8 using a single 5V power supply, and therefore the TI 2516 is a good choice of chip, since 2K of memory is adequate for the use of most experimenters and the power supply, which was part of the design specification, was kept as simple as possible. Also, it is possible to obtain a 2516 EPROM for about £3 from one of the many mail order companies.

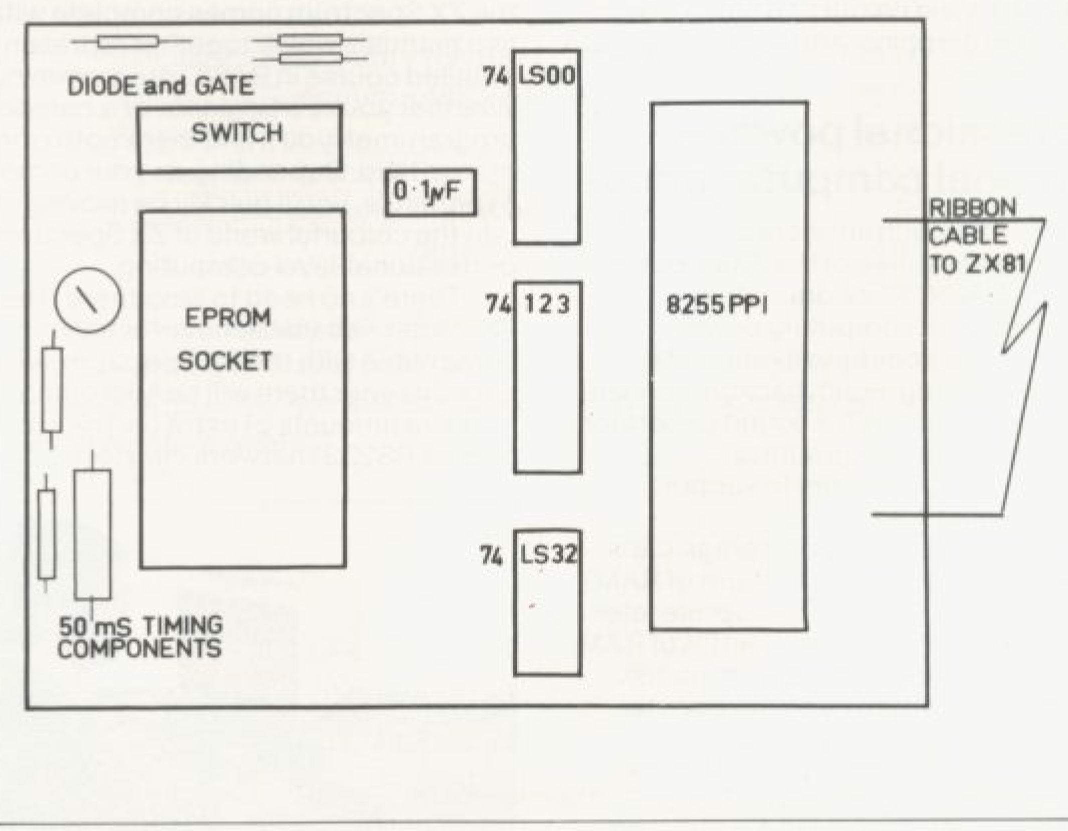
The heart of the design was an 8255 programmable peripheral interface which has 24 lines of input or output which can be defined by software. It was regarded as an excellent choice, since it is a MOS chip and places almost no DC load on the data lines and only a slight AC load on the address lines. The chip is selected when the following conditions are met.

Address	A0	A1	A2	A3	A7	IOREQ
Logic Level	H	H	H	H	L	L

This means that machine code must be used to address the chip but that was not considered to be a disadvantage, since the programmer must be familiar with machine code to use the EPROM anyway. Apart from that, the normal ZX memory map is left free and, in fact, the area between where the Sinclair ROM finishes (8K) and where free RAM starts (16K) was chosen, which could well be used to hold routines to enhance Sinclair Basic.

The address was not fully decoded but some readers will notice that the chip select conditions mean that other ports used by ZX-81 are not affected — e.g., the printer.

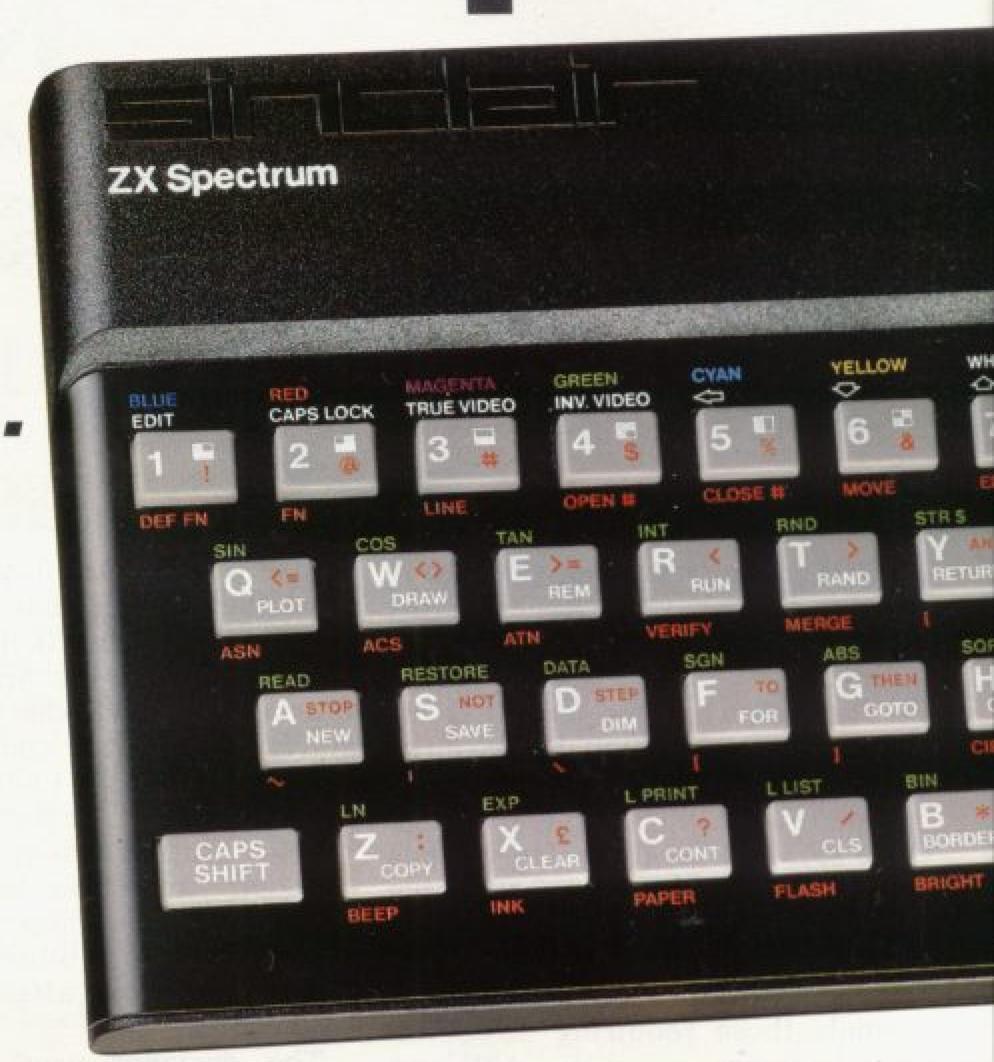
The designer used a two-tier approach to accommodate the two PCBs inside a plastic box. Considering the short time allowed to complete the design, the final hardware was considered to be well



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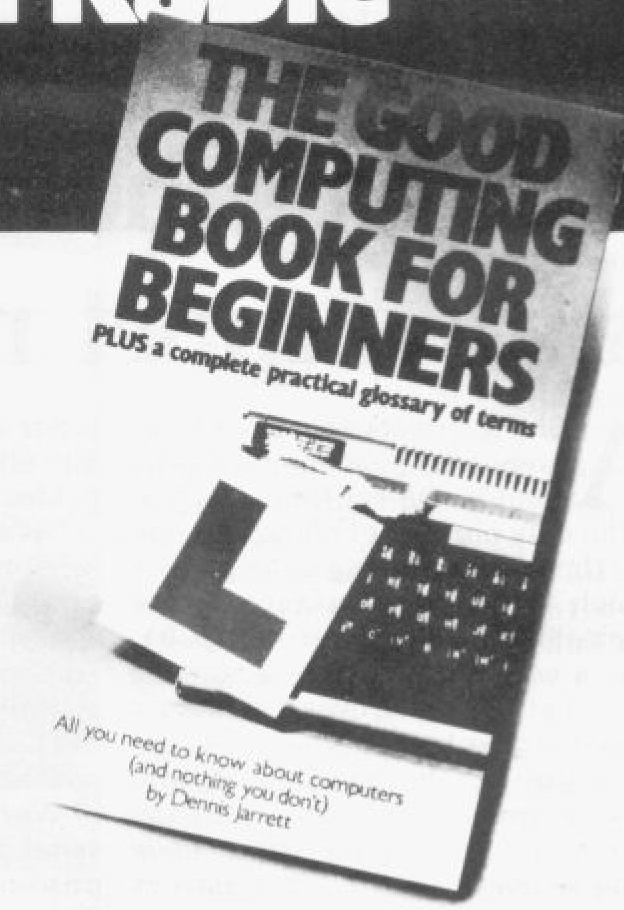
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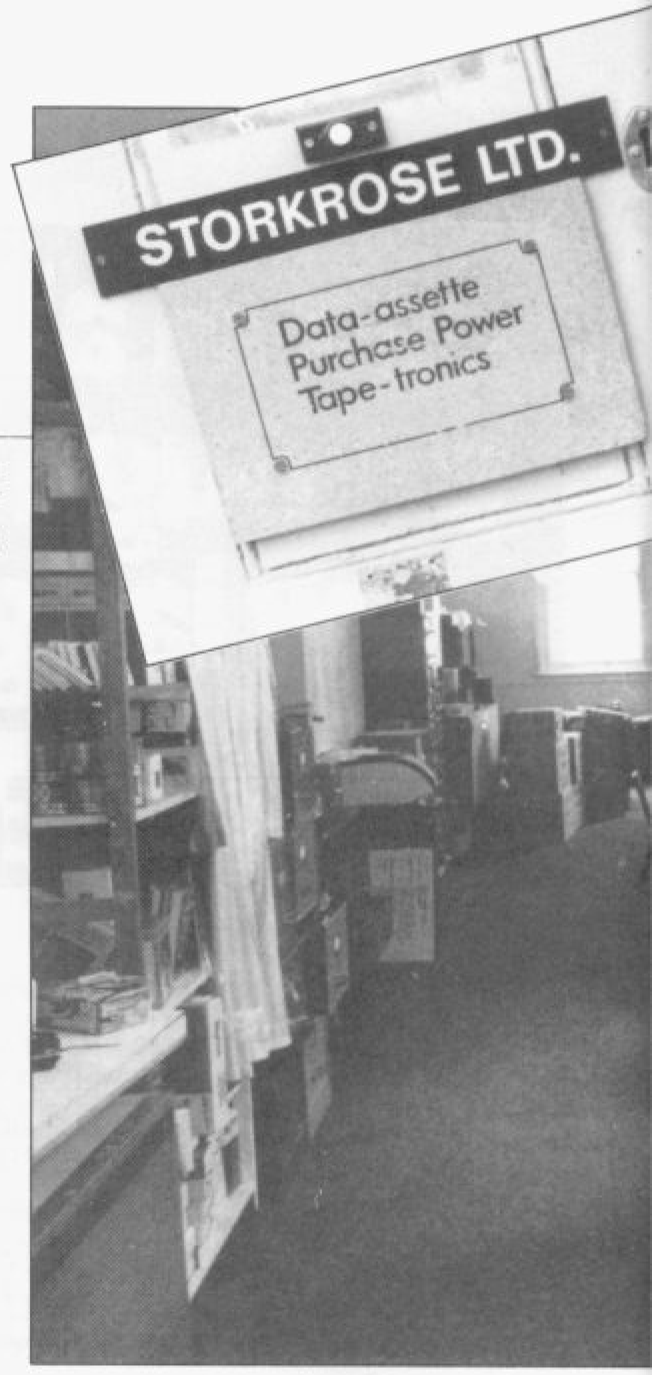
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Data-Assette entered the ZX-81 market via its tape business. It now sees its future tied closely to the Sinclair machine

Leading the way into new export markets

A SMALL wooden sign on an anonymous blue door in a side-street in the centre of London is the only clue that behind it is one of the fast-growing companies which is taking advantage of the explosion in demand for the ZX-81. It is a company which is becoming much better-known overseas than it is in this country.

Despite its business in Britain having grown substantially in the last year, its export sales have grown even faster. It answers queries regularly from and plays host to ZX-81 enthusiasts from all over the world.

Data-Assette attracted the attention of ZX-81 users when it introduced the ZX-99 tape control system in April. It entered an add-on market which was depressed in Britain because of the launch of the Spectrum. The market for exports, however, was just beginning to expand.

"We launched the ZX-99 when the market was reasonably mature in Britain but it was only just starting in the rest of the world and I think that helped us a great deal," says sales manager Nigel Boyle.

"Whereas users in this country already had many of the add-ons available in the market and were buying the ZX-99 to supplement them, people overseas were only just beginning to look at the add-on market and when they placed an order with us they were also asking for other items from other companies.

"We are finding that people from overseas prefer to go to a single supplier in the centre of London rather than having to visit all the add-on suppliers throughout the country."

The result is that the company now acts as an export agent in most of Western Europe and the English-speaking world for a number of companies, including Kayde and Phoenix Marketing for hardware, and software houses such as JRS, Artic and Carnell.

Data-Assette is the latest venture by an American, Pete Wills, who bought a small British mail order company which was in difficulties two-and-a-half years ago. He managed to turn round the company initially by selling clock radio recorders aimed at Open University students who could use them to record their lectures, broadcast usually at awkward hours.

The company then expanded into the market for hi-fi accessories. One of the major markets was selling cassette tapes wholesale. It became aware of the home computer market when it began to have a demand for short tapes on which to record programs. Data-Assette was set up to take advantage of that.

"We now supply tapes for the full range of personal computers but the biggest proportion of them are for the Sinclair market," Boyle says.

The company expanded later into the mass production of tapes for software houses and then development of the ZX-99.

"Both the owner and I have Sinclairs and we soon realised that it did not do all we wanted it to do, so we found someone to build what we wanted," Boyle says. "We were talking initially about a switching unit and we went from there to something which would work under program control."

He adds that after developing the tape control system, the company found it had some spare space in the read-only memory. It was decided to use it by adding an RS232C printer interface.

"We now have a product which allows people to have all the facilities of the Spectrum, apart from sound and colour graphics, just by buying a ZX-81 add-on," Boyle says.

"The response has been phenomenal. We are receiving about 20 enquiries a day about it. We realised the market was big but we did not

'The ZX-99 entered a depressed British add-on market but the market for exports was just beginning to expand'



Gwen Shafieian and Nigel Boyle study their new copying machine.

realise how big." Company growth can be seen from the turnover figures. In April, 1981 sales were slightly more than £1,200. In April, 1982 they were £16,000 in Britain, with another £3,000 in exports. By June, export sales had risen to £9,000 but sales in Britain had fallen to £6,000.

"Sales are varying between £15,000 and £20,000 a month and we are aiming for profit on that of about 30 percent," says Mrs Gwen Shafieian. She adds that although the company still sells goods in the old markets, by far the largest part of its turnover is in the Sinclair market.

As the company is growing so quickly, all the profit is ploughed back for further development and keeping Data-Assette working from day to day.

In common with all small, rapidly-expanding businesses, Data-Assette has to be careful that it keeps tight control on its financial position. Cash-flow always has to be watched carefully to make sure there is sufficient to pay bills when they arrive. Suppliers usually are wary of new, small companies in the volatile mail-order, home-computer market and can be unwilling to give extended credit facilities.

"Luckily the owner has a good deal of business experience and makes sure we can walk before we try to run. Often he is able to spot the problems before they arise and so we can take steps to reduce them," Mrs Shafieian says.

She adds that the move into the export market was an example of the difficulties which could arise.

'In April, 1981 sales were slightly more than £1,200. In April, 1982 they were £16,000 in Britain with £3,000 in exports'

Although the company would like the market to grow, it has to be sure that it has sufficient capital to cover the increase in the payment period.

"We sent 30 99s to France in April and the payment has only just been cleared. We had to have sufficient to pay the bills while that money was tied-up."

She says that Data-Assette also needs to take extra care of its customers, as mail-order companies generally have a poor reputation for delivery.

"We keep plenty of stock to ensure that we can satisfy orders in a reasonable time and if we are unable to meet an order immediately, we keep customers informed of what is happening," she says.

Although the company is wary of expanding rapidly, it has plenty of plans for growth. It is looking to increase the export side and the mass production of program cassettes.

Talks are being held with Mitsui, the firm which sells the ZX-81 in the Far East, to sell hardware and programs in Japan, Singapore and Hong-kong. It is also looking for more manufacturers in Britain for which it can act as agent. Mills is at present in the States to oversee the increasing business there.

To cope with growth in tape duplication it has had a special copying machine built which allows 50 copies to be made at a time. It has opted for the slower copying system to achieve higher quality and fewer bad tapes.

At present the company buys high-quality Agfa PE68 tape for the blank tapes it sells wholesale and has them wound by a sub-contractor but is thinking of doing it itself.

Another possibility is to set up a retail outlet in the centre of London to serve the many overseas visitors. At present, the offices in Shroton Street, near Marylebone Station, serve as showroom; the company would like premises where it could sell a full range of hardware and software.

Other schemes included are an adaptation of the ZX-99 to fit the Spectrum and the development of software for the business market.

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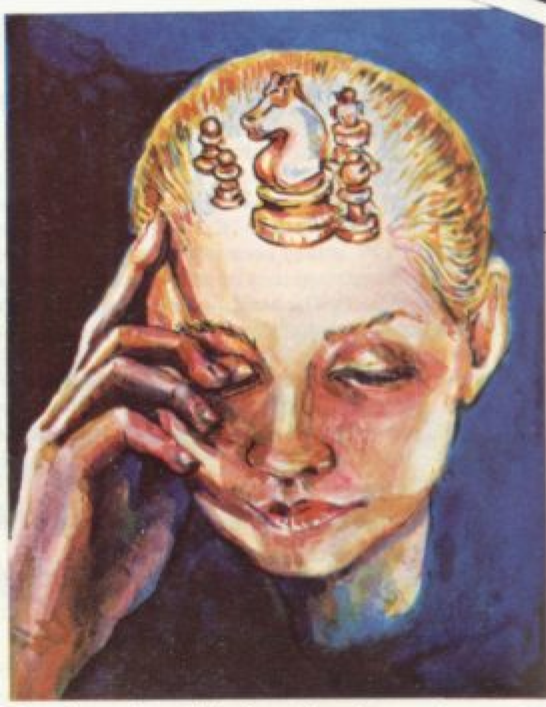
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Taking the short route to success

Philip Joy looks at readers' chess games

SIMON Gross of Ipswich, has written saying that this page does not include sufficient details about the famous mind game, chess. With details from his letter and two chess games I hope to rectify this. First, a game sent by D Egdoll, of Glasgow with details of a game in which he played against Artic Computing ZXchessII.

	D E White	ZXchessII Black
1	e2-e4	e7-e5
2	g1-f3	b8-c6
3	f1-c4	g8-f6
4	c4 × f7 ch	f7-g6
5	f3-g5 ch	f7-g6
6	h2-h4	h7-h6
7	h4-h5 ch	f6 × h5
8	d1 × h5 ch	g6-f6
9	h5-f7	f6 × g5
10	h1-h5	g5-g4
11	f7-f5 checkmate	

Another game is from P Robertson of Birmingham, who played the Micro-Gen version of chess at level 2.

white	P C black	Micro-gen
1	e4	e5
2	Nf3	Nc6
3	Bc4	Nf6
4	Ng5	d5
5	ed	Nd5
6	Nf7	Kf7
7	Qf3 +	Ke6
8	Nc3	Nb4
9	a3	Nc2 +
10	Kd1	Na1
11	Nd5	Kd6
12	d4	c6
13	Bf4	ef
14	Qf4 +	Kd7
15	Re1	b5
16	Qf5 +	Kd6
17	Qe5 +	Kd7
18	Qe6 checkmate	

Both games were won by the person who sent them. Why do you not send a game in which the computer won?

Both show that you can win in a few moves, which should prove to people who find a ZX-81 program difficult to beat that it can be done.

From the letters I receive it seems that for the player to win, it is a short game; if the computer wins or it is a draw it is much longer. If you send the games I would prefer you to use the first method of notation; it is the more standard one and is easier to read. If you have another method which you feel is just as good, please send it.

Gross, who has looked closely at Artic ZXchessII, spent many hours playing it and found some very interesting results but they did not prove how the game played.

He has sent a table showing what he thinks is the number of moves that chessII looks ahead on each level:

Level	no. of moves looked ahead
0	2
1	4
2	4
3	4
4	5
5	6
6	7 or more.

Where the moves are the same, in j1, 2 and 3, the time taken for a move was nine, 12 and 80 seconds. This might show that the game uses a different method to work out the moves on those levels. He adds that to look five moves ahead at the start of the game may show many thousands of possibilities but in the end game, five moves ahead might not be possible, as checkmate is in two.

> 'For the player to win, it is a short game; if the computer wins it is much longer'

I think the computer should look ahead as much as possible until its memory can hold no more. The levels should decide how long it spends doing this.

If you have done similar work on the version of chess you have, send the results.

I shall leave you with a problem sent by Gross which you to can try on your version of chess for ZX-81. If your version lets the computer play itself, do that, otherwise let the computer play black. It is black's move and it has to avoid being mated in three.

The position, in standard chess notation, is: White: king on h1, queen e1, rooks e2 and e3, pawns h2, g2, f2 and a5;
Black: king h8, queen a6, rooks b8 and a8, pawns c4, f7, g7 and h7.

ZXchessII was mated in three moves at levels 0 to 5. It escaped in level 6 but took 7,200 seconds. Send your results and make them as detailed as possible. One good first move for black is a6-c6.

The winner of the competition, in which I asked for the address to which a program should jump to give the amount of free memory was Colin Norris of Stanford-le-Hope, Essex.

Congratulations and if he sends a blank tape, with at least 20 minutes each side, I will record a copy of my Adventure.

The answer was 61. So to find the amount of spare memory print the line PRINT USR 61.

Anyone wishing to write to me about items in this column, or other Mind Games, can contact me at 130 Rush Green Road, Romford, Essex. If you send tapes or other information which you would like returned, please enclose a stamped-addressed envelope.

ZX SPECTRUM CITY

Within a few weeks of getting our first ZX-81 we had a good working version of "MONOPOLY". We did not think it would sell so we scrapped it. We have been kicking one another ever since! However, it was developed in parallel to a mainframe game called "CITY" which was an enhanced version of "MONOPOLY" played on a street map of London rather than the standard board. The street map took up a few hundred kilobytes and thus was not easily put into the ZX-81. The basic mechanics of the game are available for the ZX-81 but the game is played on a blank map. The streets are constructed with the buildings. Now, along came the SPECTRUM with 48K of RAM and in went the street map, not London but an imaginary town. The colour facilities made the program simpler than the mainframe version because much more information can be displayed to the player on one screen. In the end 'CITY" is not at all like the game that inspired it. Everyone that we have invited to test it says that it is much better!

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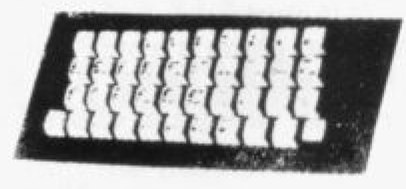
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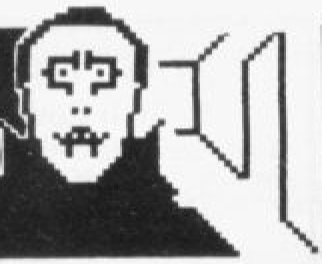
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